

# CHAPTER 4

## ENVIRONMENTAL CONSEQUENCES

---

### 4.1 INTRODUCTION

The Proposed Actions and Alternatives described in Chapter 2 may result in direct, indirect, or cumulative effects on the physical, biological, and social components of the human environment. This chapter provides discussion of the anticipated environmental consequences (impacts) that may occur as a result of implementing the Proposed Actions or any of the alternatives. Impacts may be direct, indirect, residual, or cumulative. Direct impacts are those effects that are caused by the action and occur at the same time and place as the action. Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR §1508.8). Residual impacts are those effects remaining after implementation of mitigation measures. Cumulative impacts are those that result from the impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR §1508.7).

Impacts are assessed in terms of their duration (temporary or permanent) and context (local, regional, or national effects). A temporary impact is one that occurs only during implementation of the alternative, while a permanent impact could occur for an extended period after implementation of the alternative. The impact could last several years or more. BMPs described in **Appendix E**, Environmental Protection Measures and Best Management Practices, would be used to minimize impacts, and mitigation measures designed to avoid or reduce impacts are provided. If impacts are not discussed, the analysis has indicated that none would occur or that their magnitude would be negligible.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources and the Salt Wells Energy Projects Area, review of existing literature, and information provided by experts at the BLM or other agencies. Any impacts described in this section are based on preliminary design of the proposed action alternatives. Effects are quantified where possible. In the absence of quantitative data, best professional judgment prevailed; impacts are sometimes described using ranges of potential impacts or in qualitative terms.

A level of uncertainty is associated with any set of data in terms of predicting outcomes, especially where natural systems are involved. The predictions in this analysis are intended to allow comparison of alternatives including the Proposed

Actions, as well as provide a method to determine whether activities proposed by the applicant would be expected to comply with applicable regulations (e.g., CAA).

## **4.2 LAND USE AUTHORIZATIONS, AIRSPACE, AND ACCESS**

### **Summary**

#### ***Assessment Methodology***

Land uses within and adjacent to the Salt Wells Energy Projects Area and the associated land use plans were outlined in **Section 3.2**. The current land use authorizations on the BLM managed lands are outlined in **Appendix F**, Land Use Authorizations in the Salt Wells Energy Project Area. The Proposed Actions and Alternatives have been analyzed to determine consistency with the land use plans and compatibility with the surrounding uses. Airspace and access were also discussed in **Section 3.2** and have been analyzed in this section. Recreational and hunting accesses are addressed in **Sections 3.19** and **4.19**.

#### ***Indicators***

Impact indicators are the consistent currency used to determine the type and intensity of change in a resource. Working from an established baseline condition, an indicator can be used to predict or detect change in a resource related to causal effects of Proposed Actions and Alternatives. Indicators used to determine the potential for impacts on land use, air space and access include:

- Conflicts with existing or adjacent land uses;
- Conflicts with existing federal, state, and local land uses, plans, and policies;
- Conflicts with existing BLM land use authorizations;
- Conflicts with existing Reclamation land use authorizations; or
- Changes in public land disposition.

#### ***Region of Influence***

The ROI for impacts on land use, airspace, and access includes the Salt Wells Energy Projects Area.

### **SPPC Project Area**

#### ***Proposed Action***

##### ***Direct Impacts***

Implementation of the Proposed Action would not change any land uses within the SPPC Project Area. A breakdown of the land uses by Alternative is provided in **Table 4-19**, Number of Parcels and Total Acreage (not managed by BLM) Potentially Requiring Easement Acquisition by Zoning Category, in **Section**

**4.26, Social and Economic Values.** Construction and maintenance of the transmission line could have impacts on the adjacent land uses where the Proposed Action route crosses conservation easements with a height restriction of 80 feet. Agricultural uses and private parcels would be impacted by the Proposed Action ROW, which would include temporary impacts within the 300-foot ROW and permanent impacts within the 125-foot ROW across private lands. The permanent ROW disturbance on private land would total approximately 208 acres. However, following construction of the transmission line, the footprint of the H-frame or Single Pole towers would be the only location that would not allow for agricultural or recreational use within the transmission line corridor. Single Pole transmission towers would be constructed from the Macari Switching Station to the Greenwave Substation. The majority of residential, agricultural, and industrial uses are located within this portion of the Project Area. The Single Pole structures would be spaced at 400-foot intervals with a 6- to 8- foot diameter concrete foundation. The power line would be 80 to 85 feet above ground between the poles. In addition to continued use of the majority of their lands, private landowners could be subject to financial compensation for easement or loss of utility of their lands as outlined in **Section 4.26**. A portion of the Proposed Action route would be located in Sections 35 and 36 of T18N R29E and in Section 31 of T18N R30E within APZ2. APZ2 has a lower potential for aircraft accidents. Utilities and transmission lines may be compatible uses in APZ1 and APZ2. Single-pole structures are proposed in the areas adjacent to the conservation easements and within the APZ2. The single-pole structures would be approximately 80 to 85 feet above ground level. The Proposed Action route would not be located in a Clear Zone or APZ1.

The Greenwave Substation is proposed on private land along Sheckler Road. This facility would not conflict with existing or adjacent land uses or land use plans or policies and is not located within an APZ. The proposed Bass Flat Switching Station would be constructed on public land adjacent to the ENEL 230-kV transmission line and the Austin to Fort Churchill 230-kV transmission line and is not located within an APZ. Construction and maintenance of these facilities would not conflict with the adjacent land uses, and access to these facilities would be via existing roads. Therefore, no impacts on land use, airspace, and access from these project facilities are anticipated.

Access to sites within the SPPC Project Area would be via existing roads where feasible. Use of the existing roads and the temporary spur and centerline roads could temporarily disrupt or restrict access by other users in the ROI.

#### *Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to the Proposed Action.

***Mitigation and Monitoring Measures***

SPPC would coordinate with private landowners to obtain easements and develop a compensation plan as discussed in **Section 4.26**. SPPC would also coordinate with the Navy and Churchill County to address the height restriction of 80 feet for the conservation easement parcels. Finally, SPPC would work with the Navy to ensure compliance with the guidance for APZ2 areas.

***Residual Impacts***

No residual impacts are anticipated as a result of the Proposed Action following implementation of the mitigation measures.

***Alternative 1******Direct Impacts***

Direct impacts associated with Alternative 1 would be similar to the Proposed Action; however, the Alternative 1 route would avoid crossing through adjacent existing conservation easements. In addition, the permanent ROW disturbance on private land would total approximately 79 rather than 95 acres, as under the Proposed Action.

***Indirect Impacts***

No indirect impacts on land use, airspace, or access have been identified in relation to Alternative 1.

***Mitigation and Monitoring Measures***

Mitigation measures under Alternative 1 would be the same as those outlined for the Proposed Action.

***Residual Impacts***

No residual impacts are anticipated as a result of Alternative 1 following implementation of the mitigation measures.

***Alternative 2******Direct Impacts***

Direct impacts associated with Alternative 2 would be the same as the Proposed Action. The permanent ROW disturbance on private land would total approximately 95 acres.

***Indirect Impacts***

No indirect impacts on land use, airspace, or access have been identified in relation to Alternative 2.

***Mitigation and Monitoring Measures***

Mitigation measures under Alternative 2 would be the same as those outlined for the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative 2 following implementation of the mitigation measures.

**Alternative 3 (Preferred)***Direct Impacts*

Direct impacts associated with Alternative 3 would be the same as the Proposed Action with the exception of the permanent disturbance associated with the ROW on private lands. The permanent ROW disturbance on private land would total approximately 97 acres.

*Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to Alternative 3.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative 3 would be the same as those outlined for the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative 3 following implementation of the mitigation measures.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts associated with Macari Fiber Optic Alternative would be the same as those described for the Proposed Action.

*Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to the Macari Fiber Optic Alternative.

*Mitigation and Monitoring Measures*

Mitigation measures for the Macari Fiber Optic Alternative would be the same as those outlined for the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of the Macari Fiber Optic Alternative following implementation of the mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on land use, airspace, and access would not occur.

## Ormat Project Area

### ***Proposed Action***

#### *Direct Impacts*

Implementation of the Proposed Action would not change any land uses within the ROI. The Proposed Action would occur on lands that are administered by Reclamation and BLM, as well as on private lands. A portion of the Ormat Project Area is within a no surface occupancy area which was designated to protect cultural and natural resources. One well pad is proposed in this area. As discussed in the **Section 3.15**, Native American Consultation, the BLM, in consultation with the Fallon Paiute-Shoshone Tribe, approved the location of the proposed well site. The Proposed Action would not conflict with existing federal, state, and local land uses, plans, and policies or with existing BLM or Reclamation land use authorizations.

The proposed wells A-i, B-i, and C-i and the associated pipeline would be constructed on lands adjacent to the Navy land in APZ1 and APZ2 areas. APZ1 is the area beyond the Clear Zone that still possesses a measurable potential for accidents relative to the Clear Zone. However, utilities are generally compatible in APZ1 areas except for major transmission lines. APZ2 has a measurable but lower potential for aircraft accidents relative to Clear Zones and APZ1. Utilities and transmission lines may be compatible uses in APZ2 (US Navy 2008). In addition, the Carson Lake Binary Power Plant would be located in an APZ2 area and drill rigs would be removed and only result in a temporary impact in the APZ1 and APZ2 areas. The cooling tower at the power plant would be a maximum of 55 feet for an air cooled condenser or 45 feet for a wet-cooling system. The wells, pipelines, and power plant proposed within the APZ1 and APZ2 areas could have impacts on naval operations or increase risks for aircraft accidents.

The Ormat Project Area would be accessed via Highway 50 and Macari Lane. Impacts on access would occur if the historic segments of the Lincoln Highway or the old Highway 50 were damaged during construction and operation under the Proposed Action.

#### *Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to the Proposed Action.

#### *Mitigation and Monitoring Measures*

Ormat would coordinate with the Navy to develop plans for the wells, pipelines, and the Carson Lake Binary Power Plant that would meet the requirements and height restrictions for the APZ1 and APZ 2 areas.

If the historic portions of Highway 50 were damaged as a result of the Proposed Action, Ormat would repair the damage.

*Residual Impacts*

No residual impacts are anticipated as a result of the Proposed Action following implementation of the mitigation measures.

**Alternative I (Preferred)***Direct Impacts*

Direct impacts associated with Alternative I would be the same as the Proposed Action.

*Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to Alternative I.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as those outlined for the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative I following implementation of the mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on land use, airspace, and access would not occur.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

Implementation of the Proposed Action would not change any land uses within the ROI. The Proposed Action would occur on lands that are administered by Reclamation and BLM, as well as on private lands. The Proposed Action would not conflict with existing federal, state, and local land uses, plans, and policies, or with existing BLM or Reclamation land use authorizations.

The power plant and well locations proposed under the Proposed Action would not be located in or near an APZ area. The Proposed Action would not conflict with proposed naval operations or impact airspace in the ROI.

The Vulcan Project Area would be accessed via Highway 50 and Macari Lane. Impacts on access would occur if the historic segments of the Lincoln Highway or the old Highway 50 were damaged during construction and operation under the Proposed Action.

*Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to the Proposed Action.

*Mitigation and Monitoring Measures*

If the historic portions of Highway 50 were damaged as a result of the Proposed Action, Vulcan would repair the damage.

*Residual Impacts*

No residual impacts are anticipated as a result of the Proposed Action following implementation of the mitigation measures.

**Alternative I***Direct Impacts*

Direct impacts associated with Alternative I would be the same as the Proposed Action.

*Indirect Impacts*

No indirect impacts on land use, airspace, or access have been identified in relation to Alternative I.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as those outlined for the Proposed Action

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative I following implementation of the mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on land use, airspace, and access would not occur.

**4.3 AIR QUALITY****Summary****Assessment Methodology**

Potential effects of the projects on air quality were evaluated by examining the typical air emissions associated with the various stages of transmission line construction and maintenance and geothermal development and operations. Regulatory requirements that would be required for the projects are examined here and were considered in determining both the impact criteria and in developing the impact analyses.

**Indicators**

The primary indicators of air quality impacts are the multiple ambient impact standards documented in **Section 3.3.1**, Regional Overview, that define ambient air quality, incremental degradation of air quality, and air quality-related values, including visibility. Indicators utilized for this analysis include the following:

- Emissions in tons per year for each type of regulated pollutant;
- Compliance with NAAQS, applicable Prevention of Significant Deterioration increment limits, and BLM air quality-related value impact thresholds;
- Amount and timeframe of steam/water vapor emitted from project operations; and
- Distance to Class I area.

**Region of Influence**

The ROI for assessing regional air quality impacts is the western Salt Wells Basin and Lahontan Valley east of Highway 95. The ROI for direct impacts, such as impacts on visibility and from fugitive dust, is a one buffer mile around the Salt Wells Energy Projects Area.

**SPPC Project Area****Proposed Action**

Potential impacts on air quality would result from construction activities and from periodic maintenance activities associated with the SPPC Project Area.

*Direct Impacts*

Construction. Construction activities would be the greatest source of emissions under the Proposed Action. Site grading would generate temporary and localized fugitive dust emissions. Exhaust from gas- and diesel-powered construction equipment, tractor-trailers bringing in and moving equipment, and construction personnel vehicles would generate temporary criteria air pollutant and greenhouse gas emissions. **Table 4-1**, Screening Level Analysis of SPPC Construction Emissions, shows a conservative estimate of construction emissions for development of the transmission line, switching stations, and substation.

Fugitive dust would be the primary emission of concern during project construction. The NDEP, Bureau of Air Pollution Control requires all projects that would disturb more than five acres to obtain a surface area disturbance permit prior to construction. Churchill County requires that a county dust

**Table 4-1**  
**Screening Level Analysis of SPPC Construction Emissions**  
**(tons)**

|   | <b>VOC</b>  | <b>NO<sub>x</sub></b> | <b>CO</b>   | <b>SO<sub>2</sub></b> | <b>PM<sub>10</sub></b> | <b>PM<sub>2.5</sub></b> | <b>CO<sub>2e</sub></b> |
|---|-------------|-----------------------|-------------|-----------------------|------------------------|-------------------------|------------------------|
| Commute Vehicle Emissions <sup>1</sup>        | 0.14        | 0.30                  | 2.36        | 0.0                   | 0.47                   | 0.09                    | 274.33                 |
| Heavy Duty Truck Trips <sup>2</sup>           | 0.03        | 0.24                  | 0.31        | 0.0                   | 0.08                   | 0.02                    | 69.81                  |
| Construction Equipment Emissions <sup>3</sup> | 0.60        | 4.12                  | 2.50        | 0.0                   | 0.24                   | 0.22                    | 454.07                 |
| Fugitive Dust Emissions <sup>4</sup>          | 0           | 0                     | 0           | 0                     | 14.06                  | 3.05                    | 0                      |
| <b>Total Emissions</b>                        | <b>0.77</b> | <b>4.66</b>           | <b>5.17</b> | <b>0.0</b>            | <b>14.85</b>           | <b>3.38</b>             | <b>798.21</b>          |

Source: Urban Emissions Environmental Management Software 2007

Notes: CO<sub>2e</sub> = carbon dioxide equivalents.

<sup>1</sup> Assumes 50 construction workers, 2 trips per worker, 10-mile commute distance, 250 days per year.

<sup>2</sup> Assumes 5 truck trips per day, 50 miles per trip, 250 days per year.

<sup>3</sup> Assumes a mix of construction equipment, construction occurs in one year.

<sup>4</sup> Assumes 12-month construction period; 250 acres are cleared, graded, and leveled; mitigations (soil stabilizers and watering twice daily) would reduce dust emissions by 50%.

control permit be obtained and a dust control plan be prepared for all projects that require a surface area disturbance from NDEP. Development of a Fugitive Dust Control Plan, described under Mitigation and Monitoring Measures, below, would minimize construction-related fugitive dust emissions.

In addition to fugitive dust, operation of construction equipment would produce combustion-related emissions, including NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub>, VOCs, and small quantities of air toxics (diesel PM, acetaldehyde, benzene, and formaldehyde). Development and implementation of an Equipment Emissions Mitigation Plan, described in more detail under Mitigation and Monitoring Measures, below, would reduce emissions associated with operation of construction equipment.

Operation. Operation of the SPPC 230-kV transmission line and associated infrastructure would not result in criteria air pollutants or greenhouse gas emissions. Over time, minor emissions of criteria air pollutants and greenhouse gases would result from personal and maintenance vehicle and limited equipment exhaust, as well as fugitive dust emissions from windborne dust and dust generated by vehicles travelling on unpaved surfaces. Based on the small amount of surface disturbance during operations, fugitive dust emissions would be comparable to fugitive emissions from agricultural operations and recreation already occurring in the Project Area.

#### *Indirect Impacts*

No indirect impacts on air quality from construction or operation of the SPPC Project have been identified.

*Mitigation and Monitoring Measures*

Fugitive Dust Control. SPPC or its contractors will be required to prepare a Fugitive Dust Control Plan at least 30 days prior to the start of construction. This plan will be approved by the NDEP, Bureau of Air Pollution, or, if designated by NDEP, by Churchill County. This plan will include BMPs defined by the Nevada State Conservation Commission in its Best Management Practices Handbook (1994), best practical methods included in the Dust Control Handbook for Churchill County (2010), and other measures that must be implemented during construction to reduce fugitive dust emissions. Specific measures will be developed as part of the construction planning and permitting processes; however, the Fugitive Dust Control Plan will include, at a minimum, the following measures:

- Stabilize open storage piles by covering and/or applying water or chemical/organic dust palliative where appropriate. This applies to both inactive and active sites, during workdays, weekends, holidays, and windy conditions.
- Install wind fencing and phase grading operations where appropriate, and operate water trucks for stabilization of surfaces under windy conditions; and
- When hauling material and operating non-earthmoving equipment, prevent spillage and limit speeds to 15 miles per hour. Limit speed of earthmoving equipment to 10 miles per hour.

Other BMPs and best practical methods that could be employed to control fugitive dust emissions and visibility impacts during construction could include the following:

- Apply water or dust suppressant to all active construction and site preparation work areas at least twice daily and more often during windy periods;
- Apply water or dust suppressants on all unpaved access roads and staging areas;
- Gravel access roads and staging areas;
- Reclaim (revegetate) disturbed areas as soon as possible after surface disturbance;
- Train construction personnel to recognize excessive fugitive dust conditions and implement dust control during these times;
- Install trackout control devices at paved access points to control fugitive dust from leaving the project site via trucks and motor vehicles;

- Use construction equipment that meets applicable EPA standards for criteria pollutants from diesel engines and maintain this equipment per manufacturer's specifications; and
- Sweep paved access roads with water sweepers.

Equipment Emissions Mitigation Plan. To reduce diesel particulate, carbon monoxide, hydrocarbon, and NO<sub>x</sub> emissions associated with construction activities, SPPC or its contractors will prepare an Equipment Emissions Mitigation Plan as an appendix to the POD/POU. This plan will be approved by BLM and will include, at a minimum, the following measures requiring that all construction-related engines adhere to the following:

- Are tuned to the engine manufacturer's specification in accordance with an appropriate time frame;
- Do not idle for more than five minutes (unless, in the case of certain drilling engines, it is necessary for the operating scope);
- Are not tampered with in order to increase engine horsepower;
- Include particulate traps, oxidation catalysts, and other suitable control devices on all construction equipment used at the Project site;
- Use diesel fuel having a sulfur content of 15 parts per million or less, or other suitable alternative diesel fuel, unless such fuel cannot be reasonably procured in the market area; and
- Include control devices to reduce air emissions. The determination of which equipment is suitable for control devices should be made by an independent Licensed Mechanical Engineer. Equipment suitable for control devices may include drilling equipment, generators, compressors, graders, bulldozers, and dump trucks.

#### *Residual Impacts*

Implementation of a Fugitive Dust Control Plan would minimize fugitive dust emissions during construction of the project, reducing fugitive dust and visibility impacts to acceptable levels. Implementation of an Emissions Equipment Mitigation Plan would reduce construction-related exhaust emissions to acceptable levels.

#### **Alternative I**

##### *Direct Impacts*

Direct air quality impacts from construction would be similar to those described for the Proposed Action because only slightly more acreage would be disturbed. Alternative I would require the same surface area disturbance permits and dust control plan as described for the Proposed Action. Impacts from operation would be the same as described for the Proposed Action.

*Indirect Impacts*

Alternative 1 would have no indirect air quality impacts.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as described for the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as described for the Proposed Action.

**Alternative 2**

*Direct Impacts*

Direct air quality impacts from construction would be similar to those described for the Proposed Action. Alternative 2 would require the same surface area disturbance permits and dust control plan as described for the Proposed Action. Impacts from operation would be the same as described for the Proposed Action.

*Indirect Impacts*

Alternative 2 would have no indirect air quality impacts.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as described for the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as described for the Proposed Action.

**Alternative 3 (Preferred)**

*Direct Impacts*

Direct air quality impacts from construction would be similar to those described for the Proposed Action. Alternative 3 would require the same surface area disturbance permits and dust control plan as described for the Proposed Action. Impacts from operation would be the same as described for the Proposed Action.

*Indirect Impacts*

Alternative 3 would have no indirect air quality impacts.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as described for the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as described for the Proposed Action.

### ***Macari Fiber Optic Alternative***

#### *Direct Impacts*

Development of the Macari fiber optic line would have minor, temporary air quality impacts during construction activities such as trenching. These impacts would include exhaust emissions from construction worker vehicles and from construction equipment such as trenchers, as well as fugitive dust emissions from surface-disturbing activities. A surface area disturbance permit would likely not be required, as the area of actual ground disturbance would likely be less than five acres. There would be no direct air quality impacts from operation of the fiber optic line.

#### *Indirect Impacts*

This Alternative would have no indirect air quality impacts.

#### *Mitigation and Monitoring Measures*

Depending upon the level of surface disturbance, mitigation measures described for the Proposed Action may be required to reduce air quality and visibility impacts related to fugitive dust emissions.

#### *Residual Impacts*

Implementation of the mitigation measures described under the Proposed Action, if required, would reduce the effects of construction on air quality and visibility.

### ***No Action Alternative***

The No Action Alternative would have no direct impacts on air quality, as the SPPC transmission line and associated infrastructure would not be developed. Minor indirect impacts on air quality and greenhouse gas emissions could occur to the extent that lack of additional transmission lines hindered the development of renewable sources of energy in the SPPC Project Area.

## **Ormat Project Area**

### ***Proposed Action***

Potential impacts on air quality would result from construction activities, from well drilling, and from operation of the geothermal power plant facilities.

#### *Direct Impacts*

Construction. The Proposed Action would have temporary effects on air quality from construction activities. Site grading would generate temporary and localized fugitive dust emissions. Exhaust from gas- and diesel-powered construction equipment, tractor-trailers bringing in and moving equipment, and construction personnel vehicles would generate temporary criteria air pollutant and greenhouse gas emissions. **Table 4-2, Screening Level Analysis of Ormat Construction Emissions**, presents a conservative estimate of construction

emissions for development of the power plant, substation, switching station, transmission interconnection line, pipelines, well pads, and access roads.

**Table 4-2**  
**Screening Level Analysis of Ormat Construction Emissions**  
**(tons per construction phase)**

|   | VOC         | NO <sub>x</sub> | CO          | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2e</sub> |
|---|-------------|-----------------|-------------|-----------------|------------------|-------------------|------------------|
| <b>Power Plant, Substation, Switching Station, and Interconnection Line<sup>1</sup></b> |             |                 |             |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.06        | 0.10            | 0.93        | 0.00            | 0.15             | 0.03              | 92.13            |
| Heavy Duty Truck Trips  | 0.03        | 0.24            | 0.31        | 0.00            | 0.08             | 0.02              | 69.81            |
| Construction Equipment Emissions  | 0.41        | 2.41            | 1.52        | 0.00            | 0.15             | 0.14              | 246.43           |
| Fugitive Dust Emissions   | 0           | 0               | 0           | 0               | 6.01             | 1.26              | 0                |
| <b>Total Emissions</b>  | <b>0.50</b> | <b>2.75</b>     | <b>2.76</b> | <b>0.00</b>     | <b>6.39</b>      | <b>1.45</b>       | <b>408.37</b>    |
| <b>Pipelines and Access Roads<sup>2</sup></b>   |             |                 |             |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.08        | 0.17            | 1.31        | 0.00            | 0.25             | 0.05              | 141.14           |
| Heavy Duty Truck Trips  | 0.02        | 0.18            | 0.23        | 0.00            | 0.06             | 0.01              | 52.36            |
| Construction Equipment Emissions  | 0.54        | 3.89            | 2.22        | 0.00            | 0.22             | 0.2               | 400.57           |
| Fugitive Dust Emissions   | 0           | 0               | 0           | 0               | 19.50            | 4.07              | 0                |
| <b>Total Emissions</b>  | <b>0.64</b> | <b>4.24</b>     | <b>3.76</b> | <b>0.0</b>      | <b>20.03</b>     | <b>4.33</b>       | <b>594.07</b>    |
| <b>Well Pads<sup>3</sup></b>  |             |                 |             |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.04        | 0.07            | 0.64        | 0.00            | 0.12             | 0.02              | 72.42            |
| Heavy Duty Truck Trips  | 0.01        | 0.06            | 0.08        | 0.00            | 0.02             | 0.01              | 17.45            |
| Construction Equipment Emissions  | 0.17        | 1.35            | 0.78        | 0.00            | 0.07             | 0.07              | 134.82           |
| Fugitive Dust Emissions   | 0           | 0               | 0           | 0               | 11.69            | 2.44              | 0                |
| <b>Total Emissions</b>  | <b>0.22</b> | <b>1.48</b>     | <b>1.50</b> | <b>0.0</b>      | <b>11.9</b>      | <b>2.54</b>       | <b>224.69</b>    |

Source: Urban Emissions Environmental Management Software 2007

Notes: CO<sub>2e</sub> = carbon dioxide equivalents.

<sup>1</sup> Assumes 12 months of construction; 25 construction workers per day, 2 trips per worker, 15-mile commute distance, 250 days; 5 tractor-trailer trips per day, 50 miles per trip, 250 days; standard mix of construction equipment; and 30 acres of cleared, graded, and leveled area with 50% dust control efficiency.

<sup>2</sup> Assumes 9 months of construction; 35 construction workers per day, 2 trips per worker, 15-mile commute distance, 188 days; 5 tractor-trailer trips per day, 50 miles per trip, 188 days per year; standard mix of construction equipment; and 250 acres of disturbed area with 50% dust control efficiency.

<sup>3</sup> Assumes 6 months of construction; 35 construction workers per day, 2 trips per worker, 15-mile commute distance, 125 days; 2.5 tractor-trailer trips per day, 50 miles per trip, 125 days per year; standard mix of construction equipment; and 55 acres of disturbed area with 50% dust control efficiency.

Particulates resulting from fugitive dust would be the greatest source of emissions during project construction. The NDEP, Bureau of Air Pollution Control requires all projects that would disturb more than five acres to obtain a surface area disturbance permit prior to construction. Churchill County requires that a county dust control permit be obtained and a dust control plan be prepared for all projects that require a surface area disturbance from NDEP. At least 30 days prior to construction, Ormat or its contractors would prepare a Fugitive Dust Control Plan that would be submitted for approval to the NDEP,

Bureau of Air Pollution, or, if designated by NDEP, by Churchill County. This dust control plan would include BMPs defined by the Nevada State Conservation Commission in its Best Management Practices Handbook (1994), best practical methods included in the Dust Control Handbook for Churchill County (2010), and other measures that must be implemented during construction to reduce fugitive dust emissions.

Development of a Fugitive Dust Control Plan, described in more detail under Mitigation and Monitoring Measures, below, would minimize construction-related fugitive dust emissions.

In addition to fugitive dust, operation of construction equipment would produce combustion-related emissions, including NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub>, VOCs, and small quantities of air toxics (diesel PM, acetaldehyde, benzene, and formaldehyde). Development and implementation of an Equipment Emissions Mitigation Plan, described in more detail under Mitigation and Monitoring Measures, below, would reduce emissions associated with operation of construction equipment.

Well Drilling Emissions. The primary sources of emissions during drilling would be diesel-powered engines on the drill rig, emissions from tractor trailer deliveries, and vehicle commute emissions. These emissions would be localized and temporary, with pollutant concentrations in the vicinity of the proposed project increasing on a temporary basis. Other ancillary equipment such as pumps could contribute to project emissions. **Table 4-3**, Ormat Production Well Drilling Emissions, shows a screening-level analysis of emissions from drilling operations, equipment deliveries, and commute traffic at each well pad site. Emissions are presented per well drilled.

To reduce the level of equipment exhaust emissions associated with well drilling, Ormat would require drill rigs to meet EPA Tier I emissions standards. Ormat would also develop and implement an Equipment Emissions Mitigation Plan, which would be submitted with the POD/POU and approved by the BLM. This plan, described in more detail under Mitigation and Monitoring Measures, below, would minimize equipment exhaust emissions associated with well development.

In addition to diesel equipment and vehicle emissions, well drilling has the potential to release non-condensable gases such as carbon dioxide, hydrogen sulfide (H<sub>2</sub>S), methane, and ammonia, as well as trace amounts of mercury and arsenic when these compounds are contained in the geothermal resource. The amount and ratio of these constituents varies by geothermal resource, with carbon dioxide generally comprising over 95 percent of the non-condensable gases. Emissions of non-condensable gases would occur during flow testing. These emissions would be temporary, lasting until the well is shut in or connected to the pipeline.

**Table 4-3**  
**Ormat Production Well Drilling Emissions Per Well**  
**(tons)**

|  | <b>VOC</b>   | <b>NO<sub>x</sub></b> | <b>CO</b>     | <b>SO<sub>2</sub></b> | <b>PM<sub>10</sub></b> | <b>PM<sub>2.5</sub><sup>2</sup></b> | <b>CO<sub>2e</sub></b> |
|--|--------------|-----------------------|---------------|-----------------------|------------------------|-------------------------------------|------------------------|
| Drilling operations per well <sup>1</sup>    | 2.38         | 16.42                 | 10.11         | 0.38                  | 0.95                   | --                                  | 1,002.2                |
| Tractor-trailer trips per well <sup>3</sup>  | 0.01         | 0.04                  | 0.02          | 0.00                  | 0.01                   | 0.01                                | 10.18                  |
| Personal vehicle trips per well <sup>4</sup> | 0.004        | 0.005                 | 0.065         | 0.00                  | 0.011                  | 0.002                               | 6.67                   |
| <b>Total per well pad</b>                    | <b>2.394</b> | <b>16.465</b>         | <b>10.195</b> | <b>0.38</b>           | <b>0.971</b>           | <b>0.012</b>                        | <b>1,019.05</b>        |

<sup>1</sup>Drilling rig engine is assumed to meet EPA Tier 1 large-bore diesel emission standards (40 CFR Part 89), CO<sub>2</sub> emission factor of 928 lbs CO<sub>2</sub>/hr from South Coast Air Quality Management District, Bore/Drill Rigs, 2007 model year, 1,000 horsepower engine. Emissions include two 1,000 horsepower diesel engines operating 45 days per well for 24 hours per day (1,080 hours per well) at full load. Actual well-drilling emissions are likely to be much less than estimated here, as engine use is highly variable (not at full load) over the course of the drilling operations. In addition, NO<sub>x</sub> emissions under testing conditions have been found to be less than estimations using diesel emission standards.

<sup>2</sup>Emission factor is for particulate matter (PM); it is assumed that the PM is mostly PM<sub>2.5</sub>.

<sup>3</sup>3 tractor trailer trips per day for 45 days, 50 miles per trip.

<sup>4</sup>10 construction workers per day, 2 trips per worker, 15-mile commute distance, 45 days.

Notes: Because construction equipment and vehicles no longer burn leaded fuel, no lead emissions would occur.

H<sub>2</sub>S is the non-condensable gas of greatest concern because it can pose a threat to human health at high concentrations (BLM and USFS 2008). It also can result in nuisance conditions at levels well below the state standard for H<sub>2</sub>S. H<sub>2</sub>S releases are of greatest concern in the event of a well blowout. Wells would contain BOPE; therefore, large releases of H<sub>2</sub>S are not anticipated. Some minor releases of H<sub>2</sub>S are expected during drilling and flow testing of wells. Monitoring devices would be installed and operated during all phases of drilling and testing, and a H<sub>2</sub>S abatement plan would be developed and implemented if it becomes apparent during drilling operations that H<sub>2</sub>S abatement is necessary to mitigate potential nuisance odors. With monitoring and abatement, H<sub>2</sub>S emissions would not result in unsafe levels.

Reservoirs at each well pad used to collect drilling muds would be closed upon completion of well drilling and establishment, preventing any windblown emissions of pollutant constituents contained in drilling muds, including silica, once the muds have dried out.

Operational Emissions. Emissions associated with operation of the Ormat Carson Lake Binary Power Plant would be limited to emissions of water vapor and gases from the cooling tower, emissions of particulates in the cooling tower drift, and vehicle emissions associated with power plant personnel. These emissions would continue for the duration of power plant operation but within

acceptable levels. In addition, there is the potential for minor releases of pentane and of non-condensable gases found in geothermal fluids.

Emissions of water vapor and gases from cooling towers can form a vapor plume during times of high humidity when the water vapor is not readily absorbed into the atmosphere. Within the ROI, this usually occurs in the colder months, when the air temperature drops and the air humidity increases. Given the proximity to Grimes Point Archaeological Site and NAS Fallon, wet-cooling operations would cease from November to May, minimizing operational times when a large vapor plume would be likely to occur. Cooling tower drift is a type of moisture release that results when small quantities of water droplets of 10 microns or greater as well as small amounts of dust and dissolved and suspended solids become airborne and are carried out with the exhaust air. Cooling tower drift would be avoided through the use of drift eliminators.

In addition to emissions from the power plant, production wells have the potential to emit the pollutants described under well drilling, above, particularly H<sub>2</sub>S. Periodic activities such as reworking, testing, outages, and well cleaning could be a temporary source of H<sub>2</sub>S emissions. As described above, well-related activities would be monitored and H<sub>2</sub>S abated if the emissions exceed state standards (to protect health) or if they result in odor nuisance conditions, which may occur at levels far below state standards.

The operation of the binary power plant would require as many as seven employees on weekdays and two employees on weekends. Emissions associated with commute vehicles would be low.

Under normal operations, binary power plants operate in a closed environment, where the geothermal fluid and the working fluid do not contact the atmosphere. The Ormat Binary Power Plant would use pentane as the working fluid. Pentane is a volatile organic compound and therefore an ozone precursor emission, but it is not an ozone-depleting substance. Because the power plant would be a closed system with the working fluid rarely exposed to the atmosphere, little impact on air quality is expected from the operation of the power plant. Safety systems incorporated in the power plant design would prevent the accidental release of significant amounts of pentane to the atmosphere. During maintenance, there may be minor emissions of nitrogen, carbon dioxide, and oxygen from the pentane system. Hydrocarbon emissions from each power plant would likely be over 5 tons per year but much less than 100 tons per year; therefore, Ormat would obtain a Class II Air Quality Operating Permit from the NDEP, Bureau of Air Pollution Control for construction and operation of its binary power plant.

Given the low background concentrations of criteria pollutants in the area, the limited lack of nearby sensitive receptors, and the limited emissions from operation of the geothermal power plant, the Proposed Action would not result in any violations of state or federal air quality standards. The project would not

occur in a nonattainment area; therefore, CAA general conformity does not apply.

#### *Indirect Impacts*

Development of the Ormat Binary Power Plant would have an indirect impact on greenhouse gas emissions if the power produced by the geothermal power plant displaced electricity generated by conventional sources of electricity. The project could have an indirect impact if the project lowered groundwater levels, resulting in drier soil conditions that increased the potential for windblown fugitive dust.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures to control fugitive dust and minimize equipment emissions during construction would be the same as described for the SPPC Project.

In addition, the following mitigation measures would be implemented during well drilling to reduce emissions associated with off-gassing and large (over 37 kilowatts) diesel well-drilling equipment:

- Monitor H<sub>2</sub>S emissions during all phases of drilling and testing and report the results to the BLM regularly. If the monitoring reveals emissions exceeding the Nevada ambient air quality standard, or levels that result in nuisance odor conditions, an H<sub>2</sub>S abatement plan would be developed and implemented. The abatement plan would include additional control measures to ensure compliance with the emission limitation. Additional control measures could include, but would not be limited to, the following:
  - Reduce the number of wells venting simultaneously, as applicable; and
  - Implement additional wellhead abatement measures, such as caustic injection between the flash tank and the portable silencer.
- Establish a public H<sub>2</sub>S hotline for reporting nuisance odor conditions if any result during project construction and operation.
- Ensure that generators over 37 kilowatts (50 horsepower) are diesel-fired units manufactured after January 1996, certified to meet at a minimum EPA Tier I Emission Standards, and equipped with an exhaust particulate filter system. Where possible, employ equipment that meets Tier 4 emission standards.

The following measures would be implemented to avoid visibility impacts:

- Cease operations of wet cooling from November to May, minimizing operational times conducive to a large vapor plume.

- Require the installation of drift eliminators to prevent cooling tower drift.

The following measures would be implemented to prevent air quality-related health and safety impacts:

- Install BOPE to the production wells to prevent large releases of H<sub>2</sub>S.
- Incorporate safety systems in the power plant design to prevent the accidental release of significant amounts of pentane to the atmosphere.

*Residual Impacts*

The implementation of the mitigation measures described previously would reduce potential air quality-related impacts to acceptable levels.

**Alternative 1 (Preferred)**

Direct and indirect impacts on air quality, mitigation and monitoring measures, and residual impacts would be the same as described for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no direct impacts on air quality, as the Ormat geothermal power plant and associated infrastructure would not be developed. Minor indirect impacts on air quality and greenhouse gas emissions could occur in that the impacts of greenhouse gases savings from geothermal energy production would not be realized.

**Vulcan Project Area**

**Proposed Action (Preferred)**

Potential impacts on air quality would result from construction activities, from well drilling, and from operation of the binary and flash geothermal power plant facilities.

*Direct Impacts*

Construction. The Proposed Action would have temporary effects on air quality from construction activities. Site grading would generate temporary and localized fugitive dust emissions. Exhaust from gas- and diesel-powered construction equipment, tractor-trailers bringing in and moving equipment, and construction personnel vehicles would generate temporary criteria air pollutant and greenhouse gas emissions. **Table 4-4**, Screening Level Analysis of Vulcan Construction Emissions, presents a conservative estimate of construction emissions for development of the power plant, substation, switching station, transmission interconnection line, pipelines, well pads, and access roads.

**Table 4-4**  
**Screening Level Analysis of Vulcan Construction Emissions**  
**(tons per construction phase)**

|   | VOC         | NO <sub>x</sub> | CO           | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> | CO <sub>2e</sub> |
|---|-------------|-----------------|--------------|-----------------|------------------|-------------------|------------------|
| <b>Power Plant and Substation<sup>1</sup></b>                               |             |                 |              |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.36        | 0.77            | 6.10         | 0.00            | 1.14             | 0.21              | 655.98           |
| Heavy Duty Truck Trips  | 0.03        | 0.24            | 0.31         | 0.00            | 0.08             | 0.02              | 69.81            |
| Construction Equipment Emissions  | 0.46        | 2.57            | 1.67         | 0.00            | 0.17             | 0.15              | 263.10           |
| Fugitive Dust Emissions   | 0           | 0               | 0            | 0               | 3.82             | 1.18              | 0                |
| <b>Total Emissions per power plant</b>                                      | <b>0.85</b> | <b>3.58</b>     | <b>8.08</b>  | <b>0.00</b>     | <b>5.21</b>      | <b>1.56</b>       | <b>988.89</b>    |
| <b>Total Emissions for Four Power Plants</b>                                | <b>3.40</b> | <b>14.32</b>    | <b>32.32</b> | <b>0.00</b>     | <b>13.20</b>     | <b>3.12</b>       | <b>3,955.56</b>  |
| <b>Pipelines and Access Roads<sup>2</sup></b>                               |             |                 |              |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.04        | 0.07            | 0.68         | 0.00            | 0.13             | 0.02              | 77.31            |
| Heavy Duty Truck Trips  | 0.015       | 0.12            | 0.15         | 0.00            | 0.04             | 0.01              | 34.9             |
| Construction Equipment Emissions  | 0.44        | 3.51            | 1.88         | 0.00            | 0.18             | 0.16              | 356.91           |
| Fugitive Dust Emissions   | 0           | 0               | 0            | 0               | 36.75            | 7.68              | 0                |
| <b>Total Emissions</b>  | <b>0.50</b> | <b>3.70</b>     | <b>2.71</b>  | <b>0.00</b>     | <b>37.1</b>      | <b>7.87</b>       | <b>469.12</b>    |
| <b>Well Pads<sup>3</sup></b>  |             |                 |              |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.08        | 0.14            | 1.28         | 0.00            | 0.24             | 0.04              | 144.95           |
| Heavy Duty Truck Trips  | 0.03        | 0.24            | 0.31         | 0.00            | 0.08             | 0.02              | 69.81            |
| Construction Equipment Emissions  | 0.34        | 2.70            | 1.56         | 0.00            | 0.14             | 0.07              | 134.82           |
| Fugitive Dust Emissions   | 0           | 0               | 0            | 0               | 23.38            | 4.88              | 0                |
| <b>Total Emissions</b>  | <b>0.45</b> | <b>3.08</b>     | <b>3.15</b>  | <b>0.00</b>     | <b>23.84</b>     | <b>5.01</b>       | <b>349.58</b>    |
| <b>Water Wells, Interconnection Line, and Switching Station<sup>4</sup></b> |             |                 |              |                 |                  |                   |                  |
| Commute Vehicle Emissions   | 0.02        | 0.04            | 0.40         | 0.00            | 0.08             | 0.02              | 49.36            |
| Heavy Duty Truck Trips  | 0.01        | 0.06            | 0.08         | 0.00            | 0.02             | 0.01              | 17.45            |
| Construction Equipment Emissions  | 0.41        | 2.95            | 1.72         | 0.00            | 0.16             | 0.15              | 324.58           |
| Fugitive Dust Emissions   | 0           | 0               | 0            | 0               | 16.50            | 3.46              | 0                |
| <b>Total Emissions</b>  | <b>0.44</b> | <b>3.05</b>     | <b>2.2</b>   | <b>0.0</b>      | <b>16.76</b>     | <b>3.64</b>       | <b>391.39</b>    |

Source: Urban Emissions Environmental Management Software 2007

Notes: CO<sub>2e</sub> = carbon dioxide equivalents.

<sup>1</sup> Assumes 12 months of construction per power plant; 122 construction workers per day, 2 trips per worker, 15-mile commute distance, 250 days; 5 tractor-trailer trips per day, 50 miles per trip, 250 days; standard mix of construction equipment; and 24 acres of cleared, graded, and leveled area with 50% dust control efficiency.

<sup>2</sup> Assumes 6 months of construction; 40 construction workers per day, 2 trips per worker, 15-mile commute distance, 125 days; 5 tractor-trailer trips per day, 50 miles per trip, 125 days per year; standard mix of construction equipment; and 350 acres of disturbed area with 50% dust control efficiency.

<sup>3</sup> Assumes 12 months of construction; 35 construction workers per day, 2 trips per worker, 15-mile commute distance, 250 days; 2.5 tractor-trailer trips per day, 50 miles per trip, 250 days per year; standard mix of construction equipment; and for 26 well pads, 110 acres of disturbed area with 50% dust control efficiency.

<sup>4</sup> Assumes 6 months of construction; 25 construction workers per day, 2 trips per worker, 15-mile commute distance, 250 days; 2.5 tractor-trailer trips per day, 50 miles per trip, 125 days per year; standard mix of construction equipment; and 150 acres of disturbed area with 50% dust control efficiency.

Particulates resulting from fugitive dust would be the greatest source of emissions during project construction. The NDEP, Bureau of Air Pollution Control requires all projects that would disturb more than five acres to obtain a surface area disturbance permit prior to construction. Churchill County requires that a county dust control permit be obtained and a dust control plan be prepared for all projects that require a surface area disturbance from NDEP. At least 30 days prior to construction, Vulcan or its contractors would prepare a Fugitive Dust Control Plan that would be submitted for approval to the NDEP, Bureau of Air Pollution, or, if designated by NDEP, by Churchill County. This dust control plan would include BMPs defined by the Nevada State Conservation Commission in its Best Management Practices Handbook (1994), best practical methods included in the Dust Control Handbook for Churchill County (2010), and other measures that must be implemented during construction to reduce fugitive dust emissions. Development of a Fugitive Dust Control Plan, described in more detail under Mitigation and Monitoring Measures, below, would minimize construction-related fugitive dust emissions.

In addition to fugitive dust, operation of construction equipment would produce combustion-related emissions, including NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub>, VOCs, and small quantities of air toxics (diesel PM, acetaldehyde, benzene, and formaldehyde). Development and implementation of an Equipment Emissions Mitigation Plan, described in more detail under Mitigation and Monitoring Measures, below, would reduce emissions associated with operation of construction equipment.

Well Drilling. The primary sources of emissions during drilling would be diesel-powered engines on the drill rig, emissions from tractor trailer deliveries, and vehicle commute emissions. These emissions would be localized and temporary, with pollutant concentrations in the vicinity of the proposed project increasing on a temporary basis. Other ancillary equipment such as pumps could contribute to project emissions. **Table 4-5**, Vulcan Production Well Drilling Emissions Per Well, shows a screening-level analysis of emissions from drilling operations, equipment deliveries, and commute traffic at each well pad site. Emissions are presented per well drilled.

To reduce the level of equipment exhaust emissions associated with well drilling, Vulcan would require drill rigs to meet EPA Tier I emissions standards. Vulcan would also develop and implement an Equipment Emissions Mitigation Plan, which would be submitted with the POD/POU and approved by the BLM. This plan, described in more detail under Mitigation and Monitoring Measures, below, would minimize equipment exhaust emissions associated with well development.

In addition to diesel equipment and vehicle emissions, well drilling has the potential to release non-condensable gases such as carbon dioxide, H<sub>2</sub>S, methane, and ammonia, as well as trace amounts of mercury and arsenic when

**Table 4-5**  
**Vulcan Production Well Drilling Emissions Per Well**  
**(tons)**

|  | VOC          | NO <sub>x</sub> | CO            | SO <sub>2</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> <sup>2</sup> | CO <sub>2e</sub> |
|--|--------------|-----------------|---------------|-----------------|------------------|--------------------------------|------------------|
| Drilling operations per well <sup>1</sup>    | 2.38         | 16.43           | 20.23         | 0.38            | 0.95             | --                             | 1,002.24         |
| Tractor-trailer trips per well <sup>3</sup>  | 0.01         | 0.04            | 0.02          | 0.00            | 0.01             | 0.01                           | 10.18            |
| Personal vehicle trips per well <sup>4</sup> | 0.004        | 0.005           | 0.065         | 0.00            | 0.011            | 0.002                          | 6.67             |
| <b>Total per well pad</b>                    | <b>2.394</b> | <b>16.475</b>   | <b>20.315</b> | <b>0.38</b>     | <b>0.971</b>     | <b>0.012</b>                   | <b>1,019.09</b>  |

<sup>1</sup>Drilling rig engine is assumed to meet US Environmental Protection Agency Tier 1 large-bore diesel emission standards (40 CFR Part 89), CO<sub>2</sub> emission factor of 928 lb CO<sub>2</sub>/hr from South Coast Air Quality Management District, Bore/Drill Rigs, 2007 model year, 1,000 hp engine. Emissions include two 1,000 hp diesel engines operating 45 days per well for 24 hours per day (1,080 hours) at full load. Actual well-drilling emissions are likely to be much less than estimated here, as engine use is highly variable (not at full load) over the course of the drilling operations. In addition, NO<sub>x</sub> emissions under testing conditions have been found to be less than estimations using diesel emission standards.

<sup>2</sup>Emission factor is for particulate matter (PM); it is assumed that the PM is mostly PM<sub>2.5</sub>.

<sup>3</sup>3 tractor trailer trips per day for 45 days, 50 miles per trip.

<sup>4</sup>10 construction workers per day, 2 trips per worker, 15-mile commute distance, 45 days.

Notes: Because construction equipment and vehicles no longer burn leaded fuel, no lead emissions would occur.

these compounds are contained in the geothermal resource. The amount and ratio of these constituents varies by geothermal resource, with carbon dioxide generally comprising the majority of the non-condensable gases. Emissions of non-condensable gases would occur during flow testing. These emissions would be temporary, lasting until the well is shut in or connected to the pipeline.

H<sub>2</sub>S is the non-condensable gas of greatest concern because it can pose a threat to human health at high concentrations (BLM and USFS 2008). It also can result in nuisance conditions at levels well below the state standard for H<sub>2</sub>S. H<sub>2</sub>S releases are of greatest concern in the event of a well blowout. Wells would contain BOPE; therefore, large releases of H<sub>2</sub>S are not anticipated. Some minor releases of H<sub>2</sub>S are expected during drilling and flow testing of wells. Monitoring devices would be installed and operated during all phases of drilling and testing, and a H<sub>2</sub>S abatement plan would be developed and implemented if it becomes apparent during drilling operations that H<sub>2</sub>S abatement is necessary to mitigate potential nuisance odors. With monitoring and abatement, H<sub>2</sub>S emissions would not result in unsafe levels.

Reservoirs at each well pad used to collect drilling muds would be closed upon completion of well drilling and establishment, preventing any windblown emissions of pollutant constituents contained in drilling muds, including silica, once the muds have dried out.

Operational Emissions. Under the Proposed Action, Vulcan would operate up to four geothermal power plants, one of which may be a dual flash power plant with the others being binary power plants.

*Binary Power Plants.* Emissions associated with operation of the binary power plants would be limited to emissions of water vapor and gases from the cooling tower, emissions of particulates in the cooling tower drift, and vehicle emissions associated with power plant personnel. These emissions would continue during operation of the power plants but within acceptable levels. In addition, there is the potential for releases of hydrocarbons from the working fluid and non-condensable gases found in the geothermal fluids.

Emissions of water vapor and gases from cooling towers can form a vapor plume during times of high humidity when the water vapor is not readily absorbed into the atmosphere. Within the ROI, this usually occurs in the colder months, when the air temperature drops and the air humidity increases. Vulcan would adjust operations to meet Nevada Administrative Code 445B.22033 standards. Cooling tower drift is a type of moisture release that results when small quantities of water droplets of 10 microns or greater as well as small amounts of dust and dissolved and suspended solids become airborne and are carried out with the exhaust air. Cooling tower drift would be avoided through the use of drift eliminators. The operation of the binary power plant would require as many as 33 employees to staff the first two binary power plants and 26 workers to staff a flash power plant. Emissions associated with commute vehicles would be low.

Under normal operations, binary power plants operate in a closed environment, where the geothermal fluid and the working fluid do not contact the atmosphere. The Vulcan binary power plants would use a hydrocarbon working fluid that would be determined once the temperature of the geothermal resource is known. Because the power plants would be a closed system with the working fluid rarely exposed to the atmosphere, little impact on air quality is expected from the operation of the power plants. Safety systems incorporated in the power plant design would prevent the accidental release of significant amounts of hydrocarbons to the atmosphere. During maintenance, there may be minor emissions of nitrogen, carbon dioxide, and oxygen from the working fluid system. Hydrocarbon emissions from each power plant would likely be over 5 tons per year but much less than 100 tons per year; therefore, Vulcan would obtain a Class II Air Quality Operating Permit from the NDEP, Bureau of Air Pollution Control for construction and operation of each binary power plant.

*Flash Power Plant.* Emissions of water vapor from the cooling tower and emissions of particulates in the cooling tower drift would be similar to those described previously for the binary power plants. In addition, in a dual flash power plant system, the non-condensable gases in the geothermal resource flow

through the turbines to the condenser (versus being contained in a closed loop). Some of the H<sub>2</sub>S would dissolve and oxidize in the condensate, but most would be extracted by the non-condensable gas removal system and released to the atmosphere through the cooling tower. Vulcan has calculated that a 60-MW flash power plant could approach the 100 ton per year threshold for H<sub>2</sub>S, which is below the level that constitutes a major source of new emissions in the federal Prevention of Significant Deterioration program but would trigger the need for a Class I Air Quality Operating Permit from the NDEP, Bureau of Air Pollution Control. Operation of the flash plant could also result in the emission of small quantities of other gases such as methane, benzene, sulfates, ammonia, boron, mercury, selenium, arsenic, and some metals, depending on the characteristics of the geothermal resource.

Once the concentrations of non-condensable gases in the geothermal resources are known and the design of the release points have been established, Vulcan would perform stationary source modeling to determine the contribution of H<sub>2</sub>S at publically accessible areas. Based on similar projects in other locations, the proposed project is expected to meet the Nevada ambient air quality standard for hydrogen sulfide. If this standard could not be met, or if plant operation resulted in odor nuisance conditions, a H<sub>2</sub>S abatement system would be installed at the flash power plant.

In addition to emissions from the power plant, production wells have the potential to emit the pollutants described under well drilling, above, particularly H<sub>2</sub>S. Periodic activities such as reworking, testing, outages, and well cleaning could be a temporary source of H<sub>2</sub>S emissions. As described above, well-related activities would be monitored and H<sub>2</sub>S abated if the emissions exceed state standards (to protect health) or if they result in odor nuisance conditions, which may occur at levels far below state standards.

#### *Indirect Impacts*

Development of the Vulcan Power Plants would have an indirect impact on greenhouse gas emissions if the power produced by the geothermal power plant displaced electricity generated by conventional sources of electricity. The project could have an indirect impact if the project lowered groundwater levels, resulting in drier soil conditions that increased the potential for windblown fugitive dust.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures to control fugitive dust and equipment exhaust emissions during construction would be the same as described for the SPPC Project.

The following mitigation measures would be implemented during well drilling to reduce emissions associated with off-gassing and large (over 37 kilowatts) diesel well-drilling equipment:

- Monitor H<sub>2</sub>S emissions during all phases of drilling and testing and report the results to the BLM regularly. If the monitoring reveals emissions exceeding the Nevada ambient air quality standard, an H<sub>2</sub>S abatement plan would be developed and implemented. The abatement plan would include additional control measures to ensure compliance with the emission limitation. Additional control measures could include, but would not be limited to, the following:
  - Reduce the number of wells venting simultaneously, as applicable; and
  - Implement additional wellhead abatement measures, such as caustic injection between the flash tank and the portable silencer.
- Establish a public H<sub>2</sub>S hotline for reporting nuisance odor conditions if any result during project construction and operation.
- Ensure that generators over 37 kilowatts (50 horse power) are diesel-fired units manufactured after January 1996, certified to meet at a minimum EPA Tier I Emission Standards, and equipped with an exhaust particulate filter system. Where possible, employ equipment that meets Tier 4 emission standards.

The following measures would be implemented to avoid visibility impacts:

- Adjust operations to avoid significant vapor plumes.
- Require the installation of drift eliminators to prevent cooling tower drift.

The following measures would be implemented to prevent air quality-related health and safety impacts:

- Install BOPE to the production wells to prevent large releases of H<sub>2</sub>S.
- Incorporate safety systems in the power plant design to prevent the accidental release of significant amounts of hydrocarbons and non-condensable gases to the atmosphere.

#### *Residual Impacts*

The implementation of the mitigation measures described previously would reduce potential air quality-related impacts to acceptable levels.

#### **Alternative I**

Direct and indirect impacts on air quality, mitigation and monitoring measures, and residual impacts would be the same as described for the Proposed Action for all project elements except the interconnection line. Under Alternative I, Vulcan would construct the Bass Flat Switching Station and an additional 4.6

miles of transmission line. This Alternative would have a slightly greater impact from construction than the Proposed Action. However, these impacts would be mitigated by implementing the construction measures described under Mitigation and Monitoring Measures discussed for the SPPC Project. Operational impacts under Alternative I would be the same as described for the Proposed Action, as the switching station and transmission line would have no effect on air quality.

#### **No Action Alternative**

The No Action Alternative would have no direct impacts on air quality, as the Vulcan Geothermal Power Plants and associated infrastructure would not be developed. Minor indirect impacts on air quality and greenhouse gas emissions could occur in that the impacts of greenhouse gases savings from geothermal energy production would not be realized.

## **4.4 MINERALS/GEOLOGY**

### **Summary**

#### **Assessment Methodology**

The potential effects of the Proposed Actions and Alternatives on geologic and mineral resources were evaluated by assessing the location of project components relative to the geological resources within the Salt Wells Energy Projects Area.

Specific geologic features may have value to mineralogical, paleontological, scenic, recreational, or cultural resources, and impacts on these resources are discussed in their respective sections. In this section, impacts on geologic features are evaluated only from the perspective of scientific value. Effects are quantified where possible.

#### **Indicators**

The following indicators were developed to evaluate potential project impacts on mineral and geologic resources:

- The number and type of claims for locatable, leasable, and salable mineral resources in the Salt Wells Energy Projects disturbance footprint. The Projects Area may be located on or near a locatable, leasable, and salable mineral resource;
- Earthquake activities, including strong seismic activities (Richter magnitude of 6.0 or above), ground failure, or landslides. An earthquake with a Richter magnitude of 6.0 or above has the potential to be destructive in areas up to 100 miles (160 km) across. Drilling activities and removal or injection of hot or cold water near fault lines have some potential to cause earthquake activities in or near the Projects Area;;

- Substantial erosion of geological units, such as with landslides and subsidence; and
- Unstable geological units, including parent material, slope angle, amount of vegetation, and location of fault lines within the Projects Area disturbance footprint. Facilities located on a geologic unit that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

***Region of Influence***

The ROI for this analysis is the Salt Wells Energy Projects Area.

**SPPC Project Area*****Proposed Action***

Potential impacts on geological and mineral resources would be limited to circumstances where the power line route would preclude access to mineral resources. Based on a review of mining claims and leases issued for mineral resources within the proposed transmission corridor, the corridor would not present an access or development issue for any identified mineral resource.

***Direct Impacts***

No direct impact on geological or mineral resources would result from implementation of the proposed transmission line project. Footings that would be constructed for each power pole would not be of sufficient depth to pose an issue concerning stability of the land surface. Between the southern SPPC Project terminus and the north end of the Bunejug Mountains, there would be little potential for geological slope stability impacts as a result of construction of the Proposed Action. From the Bunejug Mountains north to the northern Project terminus, the Project is located on level ground surfaces and would not be subject to geological instability. The Proposed Bass Flat and Pony Express Switching Stations and Fallon and Greenwave Substations are on level surfaces and not subject to general geological instability.

The proposed transmission line corridor would not preclude development of mineral resources identified in the SPPC Project Area. No salable or locatable mineral leases are located within the Project Area (BLM and USFS 2010).

***Indirect Impacts***

No unique geologic or mineral or mineral features have been identified within the Project Area. As such, no indirect impacts are expected to occur.

***Mitigation and Monitoring Measures***

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

*Residual Impacts*

No residual impacts would occur.

**Alternative 1**

Impacts to geological and mineral resources resulting from implementation of Alternative 1 would be the same as those described for the Proposed Action.

*Direct Impacts*

Direct impacts on geological and mineral resources resulting from implementation of Alternative 1 would be similar to those described for the Proposed Action.

*Indirect Impacts*

No unique geologic or mineral or mineral features have been identified within the Alternative 1 Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

*Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

*Residual Impacts*

No residual impacts would occur.

**Alternative 2**

Impacts to geological and mineral resources resulting from the Alternative 2 would include localized increases in erosion and runoff rates at construction sites. Impacts would be highest during construction, and impact intensity would diminish as disturbed sites are stabilized and revegetated, consequently reducing erosion and runoff. Once the ground surface has been stabilized, the potential for erosion and impacts on geological and mineral resources would diminish.

*Direct Impacts*

Direct impacts on geological and mineral resources resulting from implementation of Alternative 2 would be similar to those described for the Proposed Action.

*Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

*Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

*Residual Impacts*

No residual impacts would occur.

**Alternative 3 (Preferred)**

*Direct Impacts*

Direct impacts on geological and mineral resources resulting from implementation of Alternative 3 would be similar to those described for Alternative 2.

*Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

*Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

**Macari Fiber Optic Alternative**

*Direct Impacts*

Impacts under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under the Macari Fiber Optic Alternative would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond those detailed in **Appendix E**, Environmental Protection Measures.

*Residual Impacts*

Residual impacts for the Macari Fiber Optic Alternative would be the same as those outlined for the Proposed Action.

**No Action Alternative**

There would be no impacts on geological or mineral resource conditions under the No Action Alternative.

## **Ormat Project Area**

### ***Proposed Action***

#### *Direct Impacts*

No potential impacts on geological and mineral resources are expected to result from the proposed Ormat Project. Construction and operation of the proposed geothermal power plant and ancillary wells and pipeline infrastructure would not result in limited access and would not precluding development of mineral resources in the Ormat Project Area.

Ground disturbance during construction of the structures associated with the proposed Ormat Project have the potential to create unstable cut-and-fill slopes, particularly areas underlain by weak rock material and areas on or near unstable fault lines. Project construction would include grading the landscape to produce suitable footings for the transmission towers and construction of well pads, aboveground pipeline systems, Carson Lake Binary Power Plant and Substation, and associated roads. Overall, the proposed Project would be located on gentle slopes or level ground surfaces and is not subject to general geological instability.

Earthquakes can add to the instability of the weak geological features upon which structures associated with Project transmission lines, pipelines, power plants, and substations are constructed. Structures constructed on fault lines or scarps would be at higher risk of structural failure than structures situated on stable rock formations or level ground surfaces. Potential effects of earthquake activity that results in surface rupture or movement on Project features could include collapse or shearing of wells and pipelines. Consequences of this displacement would result in release of geothermal water to the surface environment and loss of production and injection well functions.

The proposed Ormat Project would not affect existing mineral development in the Project Area. No salable or leasable mineral resources are located within the Project Area (BLM and USFS 2010).

#### *Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

#### *Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

#### *Residual Impacts*

No residual impacts would occur.

**Alternative I (Preferred)***Direct Impacts*

Direct impacts on geological and mineral resources resulting from implementation of Alternative I would be similar to those described for the Proposed Action.

*Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

*Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

*Residual Impacts*

No residual impacts would occur.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

No potential impacts on geologic or mineral resources are expected to result from the proposed Vulcan Project. Construction and operation of the proposed geothermal power plant and ancillary wells and pipeline infrastructure would not result in limiting access or precluding development of mineral resources in the Vulcan Project Area.

Ground disturbance during construction of the structures associated with the proposed Vulcan Project has the potential to create unstable cut-and-fill slopes, particularly areas underlain by weak rock material and areas on or near unstable fault lines. Project construction would include grading the landscape to produce suitable footings for the transmission towers and construction of well pads, aboveground pipeline systems, Carson Lake Binary Power Plant and Substation, and associated roads. Overall, the proposed Project would be located on gentle slopes or level ground surfaces and is not subject to general geological instability.

Earthquakes can add to the instability of the weak geological features upon which structures associated with Project transmission lines, pipelines, power plants, and substations are constructed. Technology such as Enhanced Geothermal Systems, also called Induced Seismicity, has the ability to "enhance" or create geothermal resources in hot dry rock through hydraulic stimulation. Geothermal resources are enhanced by pumping high pressure cold water into

an injection well. The injection increases the fluid pressure in the naturally fractured rock which induces shear events (faulting and fracturing). In areas where fault zones are naturally present, induced shear events could generate localized micro-earthquakes. It can also interact with existing deep faults, potentially causing larger tremors.

In 2003, the Australian government reported that a company utilizing Enhanced Geothermal Systems technology was responsible for causing earthquakes with magnitudes up to 3.7. In 2006, an Enhanced Geothermal Systems project caused a 3.7 Richter magnitude earthquake in Basel, Switzerland. In 2009, a similar Enhanced Geothermal Systems project caused a 2.7 Richter magnitude earthquake in Landau, Germany. Though these earthquakes are considered minor (less than 4.0 Richter magnitude), they have potential to damage buildings and structures and shake residents of nearby cities and towns.

If Enhanced Geothermal Systems technology is proposed for this project, geothermal structures constructed on fault lines or scarps would be at higher risk of structural failure than structures situated on stable rock formations or level ground surfaces. Potential effects of earthquake activity that results in surface rupture or movement on Project features could include collapse or shearing of wells and pipelines. Consequences of this displacement could result in release of geothermal water to the surface environment and loss of production and injection well functions.

The proposed Vulcan Project would not affect existing mineral development in the Project Area. No salable or leasable mineral resources are located within the Project Area (BLM and USFS 2010).

#### *Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

#### *Mitigation and Monitoring Measures*

No mitigation and monitoring measures beyond those described in **Chapter 2, Description of the Proposed Action and Alternatives** would be required. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

#### *Residual Impacts*

No residual impacts would occur.

**Alternative I***Direct Impacts*

The actions proposed in Alternative I would not directly impact geological or mineral resources.

*Indirect Impacts*

No unique geologic or mineral features have been identified within the Project Area. As such, no indirect impacts on unique geologic or mineral features would occur.

*Mitigation and Monitoring Measures*

No mitigation and monitoring measures are proposed. Construction activities would be required to comply with the BLM and Churchill County grading and drainage ordinance provisions for developing hillsides.

*Residual Impacts*

No residual impacts would occur.

**4.5 SOILS****Summary**

Consequences of the Salt Wells Energy Projects on soil resources include temporary reduction in soil productivity at the margin of construction and staging areas, minor erosion and sedimentation due to the effects of wind and surface water runoff on exposed soil during construction, and long-term commitment of soil resources with conversion to non-soil features, including wells, pipelines, power plants, electrical substations, and transmission line towers.

**Assessment Methodology**

Baseline information for existing soil types and soil map units in the Salt Wells Energy Projects Area was compiled from the Soil Survey of Churchill County published by the NRCS (Natural Resource Conservation Service) (NRCS 2001) and information contained in the NRCS online soil database (NRCS 2010). This information includes typical parent materials, degree of vegetation, landforms/topography, and depth to shallow groundwater. In addition, an inventory of the following attributes of soil map units is included: surface texture (clay to sand), salinity or sodicity, Kw, and WEG. The surface horizon in each area is considered the growth medium available for reclamation. Each Proposed Action and Alternative is evaluated based on the information listed previously.

**Indicators**

Indicators of effects of the Proposed Actions and Alternatives are as follows:

- Acres and locations of proposed soil disturbance;

- Locations of proposed disturbance to highly erodible soil types; and,
- Quantity and quality of growth media present and salvageable for reclamation activities.

### ***Region of Influence***

The ROI for direct and indirect effects on soil resources includes areas where soil would be directly disturbed and adjacent areas that may be influenced by wind or water-borne sediment, which includes the SPPC, Ormat, and Vulcan Survey Areas.

## **SPPC Project Area**

### ***Proposed Action***

The area of proposed temporary and permanent disturbance for the SPPC Proposed Action is shown in Table 2-1. Approximately six inches, or 655,480 cubic yards, (see **Appendix G**, Table G-2) of surface horizon material is present along the proposed transmission line route. Much of the surface horizon material has a high salt and sodium content, and is of poor quality for reclamation purposes.

SPPC would finalize the POD for submittal to BLM. The POD would include implementation of BMPs to minimize impacts on soil resources.

In addition SPPC would develop a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the NPDES General Construction Stormwater Permit to minimize erosion from the project construction worksites. The SWPPP would include maps of the SPPC Project Area with potential locations for appropriate BMPs. The SWPPP would be available on site throughout the construction period. Surface water control measures identified in the SWPPP would be inspected weekly and after rain events of 0.5 inches or more in a 24-hour period.

SPPC would also prepare and implement a Reclamation Plan as described in the POD to minimize the permanent effects of soil disturbance. The Reclamation Plan is described in **Chapter 2**, Description of the Proposed Actions and Alternatives.

### ***Direct Impacts***

Potential direct impacts on soil resources would occur during soil salvage operations and soil redistribution activities. Impacts to soil during salvage and stockpiling operations include physical loss of soil from excavating and handling the soil and interruption of soil biological, physical, and chemical activity as a result of placement of soil in stockpiles. Additional soil loss would occur during reclamation when soil is re-handled from stockpiles and distributed on regraded areas. Soil loss associated with salvage, temporary stockpile, and replacement typically total about 10 percent.

Soil would be directly impacted by grading activities during construction. Limited grading would occur along access and centerline roads to allow vehicles and equipment to travel along the transmission line route. Transmission structure and stringing sites would be graded to form a relatively flat working surface. Holes would be excavated for both temporary crossing structures and permanent transmission line structures. Topsoil, where present, would be salvaged for reapplication; however soil structure and soil biota would be disturbed during the salvaging operation. Disturbance would occur in areas of cryptobiotic soils likely present in the southwestern portion of the SPPC Survey Area.

In grading areas where topsoil is not present, surface and subsurface horizons would be mixed. Mixing causes temporary dilution of organic material and salts which are frequently concentrated in the surface horizon. Mixing also may increase the coarse fragment content of the soil surface and shallow rooting zone. Potential impacts of mixing include reduced retention of soil moisture during dry periods. Potential impacts could also include temporary reductions in salinity and slight armoring of the soil surface against water erosion.

#### *Indirect Impacts*

After growth media salvage activities, some areas may be subject to deposition of wind-blown material outside the footprint of construction areas, or loss of soil due to wind erosion. These areas are described in **Table G-1**, Soil Map Units in Proposed Areas of Disturbance – SPPC Project Area, and shown in Figures 3-3, Soil Wind Erodibility Group, SPPC Southern, 3-4, Soil Wind Erodibility Group, SPPC Central, and 3-5, Soil Wind Erodibility Group, SPPC Northern.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures have been identified by BLM. Implementation of reclamation activities and Environmental Protection Measures outlined in **Appendix E** would reduce potential soil loss associated with the Proposed Action.

#### *Residual Impacts*

Residual impacts of soil mixing would include decreased productivity in those locations where organic matter and beneficial microbes were previously concentrated. In contrast, the likelihood of plant establishment would temporarily increase in locations where salts were previously concentrated, but were diluted by the project.

### **Alternative I**

#### *Direct Impacts*

Implementation of Alternative I would include temporary disturbance of five additional acres and 10 acres in the area of permanent disturbance as compared

to the Proposed Action. Therefore, impacts under Alternative 1 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 1 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 1 would be the same as those outlined for the Proposed Action.

**Alternative 2**

*Direct Impacts*

Although the route under Alternative 2 would differ slightly from the Proposed Action, the distance would be the same as would the soil types. Therefore, impacts under Alternative 2 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 2 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 2 would be the same as those outlined for the Proposed Action.

**Alternative 3 (Preferred)**

Impacts associated with Alternative 3 would be similar to Alternative 2 however the route would differ and result in an additional 0.2 miles of disturbance resulting in an increase of temporary disturbance of 2 acres compared to the Proposed Action. Therefore, impacts under Alternative 2 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 3 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 3 would be the same as those outlined for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Impacts under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under the Macari Fiber Optic Alternative would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for the Macari Fiber Optic Alternative would be the same as those outlined for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no impacts on soil resources as the transmission line and associated facilities would not be developed.

**Ormat Project Area****Proposed Action**

Temporary and permanent disturbance areas for the Ormat Proposed Action are shown in Table 2-2. Approximately six inches or 258,908 cubic yards, (see **Appendix G**, Table G-5, Volume of Growth Medium - Ormat Project Area - Proposed Action) of surface horizon material is present in the footprint of the Proposed Action. Most of this surface horizon material has a high salt and sodium content, and is a poor quality growth medium for typical reclamation plants.

Ormat Technologies would prepare and implement an SWPPP to minimize erosion from the project construction worksites. The SWPPP would be prepared in accordance with the NPDES General Construction Stormwater Permit and identify existing drainage patterns of construction worksites and ROWs, nearby drainages and washes, potential pollutant sources other than sediment, and the BMPs that that would be implemented to minimize off-site

erosion and sedimentation. The SWPPP would include maps of the Project Area with potential locations for appropriate BMPs. Surface water control measures identified in the SWPPP would be inspected weekly and after rain events of 0.5 inches or more in a 24-hour period.

Ormat Technologies would prepare and implement a Reclamation Plan to minimize the permanent effects of soil disturbance in those areas not committed to non-soil features. The Reclamation Plan is described in **Chapter 2**, Description of the Proposed Action and Alternatives.

#### *Direct Impacts*

In the area of permanent disturbance (208 acres), soil resources would be committed to development of non-soil features, such as well pads, access roads, pipelines, the power plant, and interconnection line. In the area proposed for temporary disturbance (124 acres), topsoil, where present, would be salvaged for reapplication.

Potential direct impacts on soil resources would occur during soil salvage operations and soil redistribution activities. Impacts to soils during salvage and stockpiling operations include physical loss of soil from excavating and handling the soil and interruption of soil biological, physical, and chemical activity as a result of placement of soil in stockpiles. Additional soil loss would occur during reclamation when soil would be re-handled from stockpiles and distributed on regraded areas. Soil loss associated with salvage, stockpile, and replacement typically totals approximately 10 percent.

In graded areas where topsoil is not present, surface and subsurface horizons would be mixed. Mixing causes temporary dilution of organic material and salts which are frequently concentrated in the surface horizon. Mixing also may increase the coarse fragment content of the soil surface and shallow rooting zone. Potential impacts of mixing include reduced retention of soil moisture during dry periods. Potential impacts could also include temporary reductions in salinity and slight armoring of the soil surface against water erosion.

#### *Indirect Impacts*

After implementation of the Proposed Action, some areas may be subject to the deposition of wind-blown material outside the footprint of construction areas, or loss of soil due to wind erosion. Multiple locations along the Ormat Survey Area exhibit susceptibility to wind erosion (WEG 1). These areas are outlined in Table G-4 and are shown on Figure 3-6. In addition, construction in areas with seasonal ponding of water may cause soil to have increased moisture on the upgradient side of the constructed feature which may cause increased soil salinity in areas where ponded or shallow water becomes more isolated and stagnant.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures have been identified by BLM. Implementation of reclamation activities and BMPs outlined in the Proposed Action would reduce potential soil loss associated with the Proposed Action.

*Residual Impacts*

Residual impacts of soil mixing would include decreased productivity in those locations where organic matter and beneficial microbes were previously concentrated. In contrast, the likelihood of plant establishment would temporarily increase in locations with slightly elevated salt concentrations that become diluted with non-saline or less saline subsoil.

**Alternative I (Preferred)***Direct Impacts*

Alternative I includes three fewer acres of temporary disturbance and 13 fewer acres of permanent disturbance than the Proposed Action. Impacts under Alternative I would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative I would be the same as those outlined for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no impacts on soil resources as the power plant and associated facilities would not be developed.

**Vulcan Project Area****Proposed Action (Preferred)**

Temporary and permanent disturbance areas for the proposed Vulcan Project are shown in Table 2-4. Approximately five inches, or 842,799 cubic yards, (see Table G-8) of surface horizon material is present in the footprint of the Proposed Action. Most of this surface horizon material has a high salt and sodium content, and is a poor quality growth medium for typical reclamation plants.

Vulcan would prepare and implement an SWPPP to minimize erosion from the project construction worksites. The SWPPP would be prepared in accordance

with the NPDES General Construction Stormwater Permit and identify existing drainage patterns of construction worksites and ROWs, nearby drainages and washes, potential pollutant sources other than sediment, and BMPs that would be implemented to minimize off-site erosion and sedimentation. The SWPPP would include maps of the Project Area with potential locations for appropriate BMPs. Surface water control measures identified in the SWPPP would be inspected weekly and after rain events of 0.5 inches or more in a 24-hour period.

Vulcan would prepare and implement a Reclamation Plan to minimize the permanent effects of soil disturbance in those areas not committed to non-soil features. The Reclamation Plan is described in **Chapter 2, Description of the Proposed Action and Alternatives**.

#### *Direct Impacts*

In the area of permanent disturbance (750 acres), soil resources would be committed to development of non-soil features, such as well pads, access roads, pipelines, the power plant, and transmission lines. In areas proposed for temporary disturbance (504 acres), growth media, where present, would be salvaged for reapplication.

Potential direct impacts on soil resources would occur during soil salvage operations and soil redistribution activities. Impacts to soil during salvage and stockpiling operations include physical loss of soil from excavating and handling the soil and interruption of soil biological, physical, and chemical activity as a result of placement of soil in stockpiles. Additional soil loss would occur during reclamation when soil is re-handled from stockpiles and distributed on regraded areas. Typically, soil loss totals approximately 10 percent as a result of salvage, stockpiling, and replacement on industrial sites.

In graded areas where topsoil is not present, surface and subsurface horizons would be mixed. Mixing causes temporary dilution of organic material and salts which are frequently concentrated in the surface horizon. Mixing could also increase the coarse fragment content of the soil surface and shallow rooting zone. Potential impacts of mixing include reduced retention of soil moisture during dry periods. Potential impacts could also include temporary reductions in salinity and slight armoring of the soil surface against water erosion.

#### *Indirect Impacts*

After implementation of the Proposed Action, some areas may be subject to deposition of wind-blown material outside the footprint of construction areas, or loss of soil due to wind erosion. These areas are described in Table G-7, Soil Map Units in Proposed Areas of Disturbance – Vulcan Project Area, and shown on Figure 3-7, Soil Wind Erodibility Group, Vulcan. In addition, construction in areas with seasonal ponding of water could cause soil to have increased moisture on the upgradient side of the constructed feature, and could result in

increased soil salinity in areas where ponded or shallow water becomes more isolated and stagnant.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures have been identified by BLM. Implementation of reclamation activities and BMPs outlined in the Proposed Action would reduce potential soil loss associated with the proposed Vulcan Project.

*Residual Impacts*

Residual impacts of soil mixing would include decreased productivity in those locations where organic matter and beneficial microbes were previously concentrated. In contrast, the likelihood of plant establishment would temporarily increase in locations with slightly elevated salt concentrations that become diluted with non-saline underlying soil.

**Alternative I**

*Direct Impacts*

Implementation of Alternative I would involve 173 acres of additional temporary disturbance and 75.9 acres of additional permanent disturbance. The direct impacts of Alternative I would be similar to those described under the Proposed Action; however, Alternative I would extend into additional acreage to the south of the Proposed Action. Soil types associated with this additional acreage is highly susceptible to wind erosion.

*Indirect Impacts*

Indirect impacts under Alternative I would be similar to but greater than those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative I would be the similar to but greater than those outlined for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no impacts on soil resources as the power plants and associated facilities would not be developed.

## **4.6 FARM LANDS (PRIME OR UNIQUE)**

This section presents the consequences that the Proposed Actions and Alternatives are likely to have on Prime or Unique Farmlands. Mitigation measures are discussed for reducing any impacts that surface disturbance and constructed features may have to agricultural operations.

**Summary**

No land is classified as Unique Farmland in the Salt Wells Energy Projects Area. All potential Prime Farmland in the Projects Area requires irrigation, abatement of salts, or depends upon climatic and wind erosion variables to qualify as Prime Farmland. No potential Prime Farmland is present in the badlands, playas, rocky areas, and salt flats of the Bunejug Mountains and surroundings (Figure 3-9, Prime Farmlands).

The consequences of the project on potential Prime Farmland include temporary disruption of agricultural activities during construction of transmission towers and stringing of transmission lines as well as conversion of land in the footprint of transmission line towers into non-farmland. No areas currently in agricultural use are present in the footprint of proposed wells, pipelines, and power plants.

**Assessment Methodology**

The acreage of potential Prime Farmlands was determined for each Proposed Action and Alternative. Within the potential Prime Farmland areas, estimates were produced of the following impacts:

- Total acres that would be converted directly to non-farm lands,
- Total acres that would be converted indirectly to non-farm lands through interference with land patterns, and
- Total acres to remain as farmland.

The majority of the potential Prime Farmland in the vicinity of the Projects Area is located on private land, with the exception of potential Prime Farmland on Reclamation land immediately north and northwest of Carson Lake and Pasture (see Figure 3-9, Prime Farmlands). The entire Salt Wells Energy Projects Area is located on and borders non-urban land. The northern end of the SPPC Survey Area is within one mile of urban land in the city of Fallon.

**Indicators**

The previous information is provided to assist with agency completion of Parts I, III, and VI of the Impact Rating Forms obtained from the NRCS for corridor and non-corridor projects (NRCS 2010).

**Region of Influence**

The ROI for direct and indirect effects on Prime or Unique Farmlands includes areas where soil would be directly disturbed and adjacent areas that may be influenced by wind or water-borne sediment, which includes the SPPC, Ormat, and Vulcan Survey Areas

**SPPC Project Area**

The SPPC Survey Area includes agricultural land directly south of Fallon and non-agricultural land in the vicinity of the Bunejug Mountains. The following

describes the quantity of potential Prime Farmland to be disturbed or altered in the SPPC Survey Area.

### **Proposed Action**

#### *Direct Impacts*

Within the potential Prime Farmland in the vicinity of the SPPC Proposed Action, 370 acres are proposed for temporary disturbance. As shown in **Table 4-6**, Potential Prime Farmlands: Impacted Acreage – SPPC Survey Area, after construction is completed, 1 acre of potential Prime Farmland would be occupied by the footprint of H-frame transmission towers, and would be converted directly to non-farm land.

**Table 4-6**  
**Potential Prime Farmlands Impacted Acreage SPPC Survey Area**

|                        | <b>Temporary<br/>Disturbance</b> | <b>Converted<br/>Directly to<br/>Non-farm<br/>Land*</b> | <b>Land Patterns<br/>Disrupted**</b> | <b>Unaffected<br/>Farmland After<br/>Construction<br/>Completed</b> |
|------------------------|----------------------------------|---|--------------------------------------|---|
| <b>Proposed Action</b> | 370.1                            | 1.1   | 150.7                                | 218.3   |
| <b>Alternative 1</b>   | 408.1                            | 1.1   | 169.6                                | 237.4   |
| <b>Alternative 2</b>   | 366.9                            | 1.1   | 149.3                                | 216.5   |
| <b>Alternative 3</b>   | 366.9                            | 1.1   | 149.3                                | 216.5   |

\*Within 40 foot by 10 foot footprint of H-frame transmission towers located one per 1,000 feet of corridor length.

\*\*Area not in footprint of transmission towers, but disrupted by the transmission line ROW.

#### *Indirect Impacts*

The Indirect Impact of the Proposed Action is slight disruption of land patterns in the remainder of the permanent ROW (151 acres). Potential Prime Farmland in the area outside the permanent ROW (218 acres) would remain, and be unaffected.

#### *Mitigation Measures*

The proposed transmission line corridor would be located generally at the margins of existing property boundaries; adjacent to roadways or canals. SPPC would work directly with landowners along the transmission line route to determine the specifications for post-construction reclamation of compaction or rutting that may occur, in order to return farmland to productivity. Mitigation measures for compaction or rutting may include regrading or chiseling 18 inches deep. SPPC would also work directly with landowners to identify if landowners' communication circuits are disrupted by the project, and would seek to eliminate such disruption.

After construction is complete, SPPC would remove all material that is not an integral part of the installed project, including litter. The footprint of towers

would be the only location where SPPC occupancy would not allow agricultural use, and the areas between the towers would be available for continued farming.

*Residual Impacts*

After mitigation measures are employed, the footprint of transmission towers would be unavailable as farmland, and land patterns would be slightly disrupted in the permanent ROW of the transmission line. The kind and intensity of the Proposed Action is compatible with agriculture and is not likely to reduce services to potential Prime Farmlands.

**Alternative 1**

*Direct Impacts*

Alternative 1 includes 42 additional acres of temporary disturbance and 33 acres in the permanent ROW as compared to the Proposed Action. Impacts under Alternative 1 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 1 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 1 would be the same as those outlined for the Proposed Action.

**Alternative 2**

*Direct Impacts*

Impacts under Alternative 2 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 2 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 2 would be the same as those outlined for the Proposed Action.

**Alternative 3 (Preferred)***Direct Impacts*

Alternative 3 includes 7 additional acres of temporary disturbance and 3 acres in the permanent ROW as compared to the Proposed Action. Impacts under Alternative 3 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 3 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative 3 would be the same as those outlined for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Impacts under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under the Macari Fiber Optic Alternative would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for the Macari Fiber Optic Alternative would be the same as those outlined for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no impacts on Prime and Unique Farmlands as the transmission line and associated facilities would not be developed.

**Ormat Project Area**

Although the Ormat Project is not located in an area of agricultural land use, the majority of the Project Area is on land that has been technically classified as Prime Farmland if reclaimed of salts and sodium. The scale of impacts for the Proposed Action and Alternative 1 are the same, but occur in slightly different locations.

**Proposed Action***Direct Impacts*

Potential Prime Farmland in the Ormat Survey Area is located mostly in the northern portion of the Survey Area; however one of the proposed well pads in the southern portion of the Ormat Survey Area would be located in potential Prime Farmland. As shown in Table 3-9, Acres of Potential Prime Farmland – Ormat Survey Area, there are 198.6 acres of potential Prime Farmland in the Ormat Survey Area, of which 193 acres would require abatement of salts and sodium to qualify as Prime Farmland. Under the Proposed Action, all of this acreage would be permanently unavailable as Prime Farmland.

*Indirect Impacts*

All tracts of land that encounter proposed pipelines would be indirectly affected by disruption of land patterns.

*Mitigation and Monitoring*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

No land would remain available as Prime Farmland within the footprint of the Proposed Action; however the current land use in the Ormat Survey Area is not agricultural.

**Alternative I (Preferred)***Direct Impacts*

Alternative I includes three fewer acres of temporary disturbance and 13 fewer acres of permanent disturbance than the Proposed Action, all of which are on land that is not currently used for agriculture but would qualify as Prime Farmland if abated of salts and sodium. The types of impacts would be same at those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts for Alternative I would be the same as those outlined for the Proposed Action.

**No Action Alternative**

The No Action Alternative would have no impacts on Prime and Unique Farmlands as the power plant and associated facilities would not be developed.

**Vulcan Project Area**

No Prime or Unique Farmlands are located in the Vulcan Project Area; therefore, and the Proposed Action and Alternatives would not impact Prime or Unique Farmlands.

**4.7 WATER QUALITY AND QUANTITY****Summary**

This section describes the potential impacts on surface water and groundwater resources that could occur from the Proposed Actions and Alternatives. The geothermal energy source is stored within a basalt-rich volcanic/plutonic aquifer and an ash-flow tuff aquifer underlying the Salt Wells Energy Projects Area (Figure 3-12, Conceptual Hydrologic Block Model Diagram). A near-surface aquifer complex overlies the basalt aquifer and comprises unconsolidated valley-fill sediments. The valley-fill aquifer is tapped by irrigation and water supply wells. Each of these aquifers could be affected by the Proposed Actions and Alternatives associated with the Ormat and Vulcan projects.

Surface water resources present within or near the Salt Wells Energy Projects Area that could be affected by geothermal development include Carson Lake and surrounding wetland complex, other perennial and seasonal wetlands, the irrigation system north and west of the proposed development area, irrigation and water supply wells, hot and warm springs and seeps, non-thermal springs, ephemeral surface water flow in drainages, and the playas (e.g., Eightmile Flat, Fourmile Flat, Turupah Flat, and Bass Flat).

**Assessment Methodology**

The assessment for potential impacts on water resources was based on regional and site-specific information presented in **Chapter 3, Affected Environment**. A conceptual hydrologic model was developed using the available information to complete the water resources impact analysis. A description and diagram of the conceptual model are presented in **Section 3.7, Water Quality and Quantity** (Figure 3-12). The model was used as the basis for estimating potential impacts on water resources resulting from the production of geothermal energy within the Projects Area.

**Indicators**

The following indicators have been identified in order to evaluate potential project impacts on water resources:

- Alteration of surface water drainage patterns, which could result in increases in suspended sediment and turbidity in surface water

drainages where the geothermal power plants, transmission lines, substations, and switching stations would be constructed.

- Release of pollutants other than sediment to the environment during construction, operation, and maintenance of the facilities described previously.
- Lowering of groundwater levels due to extraction wells that could affect soils (reduced saturated zones and increased fugitive dust); wetlands and riparian areas (reduced vegetation and source water); springs (reduced flows); changes in wildlife habitat; changes in range/grazing (reduced vegetation and/or water availability); and water rights (depressed groundwater levels in wells; reduced flow in surface water). Reductions in groundwater levels could decrease the volumes of groundwater stored in the various aquifers and reduce yields.
- Mounding of groundwater levels due to injection wells that could affect soil (increased saturated zones); wetlands and riparian areas (increased water available to wetland areas); springs (increased flows); and groundwater flow patterns. Increases in groundwater elevations could increase the volumes of water in the various aquifers and enhance yields. Water re-injected into the subsurface under the proposed geothermal projects may or may not recharge the aquifer from which it was extracted.
- Changes in flow from springs and in surface water drainages.
- Changes in groundwater and/or surface water temperatures.
- Changes in groundwater and/or surface water quality.
- Changes in source water and vegetation at wetland areas.
- Flash flooding effects on proposed facilities.

### ***Region of Influence***

The ROI for water resources is shown on Figure 3-10, Springs, Seeps, and Surface Water Features, and consists of an area bounded by the following features:

- Western edge of the Carson Lake wetlands on the west (boundary between R28E and R29E);
- Eastern edge of Fourmile Flat on the east;
- Fallon, Nevada, on the north; and
- Southern edge of the Vulcan lease boundary.

This ROI was selected because of the expected potential impact area for water resources due to the pumping and reinjection of groundwater at proposed drill pads for geothermal development in the Ormat and Vulcan leases. Water

resources within the ROI include springs, seeps, irrigation ditches/canals, Carson Lake, playas, ephemeral surface water flow in drainages, and groundwater supply wells.

### **SPPC Project Area**

#### ***Proposed Action***

Development of the SPPC project facilities would require approximately 789 acres of temporary ground disturbance and 352 acres of permanent disturbance. Vegetation and topsoil removal and slope grading would be required to complete the project.

#### ***Direct Impacts***

Potential direct impacts on water resources would coincide with the construction phase of the project and, therefore, would be temporary. Potential direct effects include:

- Accidental release of chemical pollutants to the environment during construction, operation, and maintenance of the facilities described previously. The most likely potential impacts would be from spills of petroleum products on the ground used during construction operations. This could affect surface water and/or shallow groundwater if sufficient product is released.
- Erosion and sedimentation to surface water caused by removal of vegetation and ground disturbance during facility and road construction from heavy equipment and blasting. The most likely changes would be increases in suspended sediment and turbidity in surface water during runoff conditions (e.g., overland flow into ephemeral drainages and wetlands).

#### ***Indirect Impacts***

Potential indirect impacts on water resources could occur due to removal of vegetation in some of the 789 acres of temporary ground disturbance and 352 acres of permanent disturbance. This could result in changes in rates of evapotranspiration from and recharge to shallow groundwater. These effects would be temporary until disturbed areas are re-vegetated where possible.

#### ***Mitigation and Monitoring Measures***

As described in **Chapter 2**, Description of the Proposed Action and Alternatives, and **Appendix E**, Environmental Protection Measures and Best Management Practices, SPPC would implement plans for the protection of streams, wetlands, springs, and canals. These plans include BMPs that minimize potential for soil erosion, including a SWPPP. The SWPPP would include measures to prevent erosion of disturbed soil. All areas subject to temporary disturbance would be recontoured, decompacted, and seeded, or left in-place as directed by the BLM or private landowner.

During construction of facilities, designated personnel would visually monitor disturbed areas for evidence of soil erosion and associated impacts on surface water. Appropriate actions would be taken to correct any identified problems such as excessive erosion or accidental spills.

#### *Residual Impacts*

No residual impacts on water resources are expected after completing construction of the transmission lines and associated facilities, and implementation of the mitigation and monitoring measures described previously.

#### **Alternatives**

Impacts and mitigation and monitoring measures described previously are also applicable to the four Alternatives listed in **Chapter 2**, Description of the Proposed Actions and Alternatives, for the SPPC Transmission Line Corridor. For longer transmission line routes, the potential magnitude of impacts is larger because more area would be disturbed and the construction period would be longer. The Macari Fiber Optic Alternative would include a 1-mile long trench along Macari Lane to Highway 50. Although the total areas of temporary and permanent disturbance vary among the Alternatives, the affected acreages are not appreciably different. The associated differences in potential impacts associated with implementation of Alternatives are expected to be slight, and effects on water resources are expected to be similar under each Alternative.

### **Ormat Project Area**

#### **Proposed Action**

The total estimated areas of temporary and permanent disturbance for the Ormat Proposed Action are approximately 332 acres and 208 acres, respectively.

Wells drilled for the project would be used for geothermal groundwater production, groundwater re-injection, and observation. Target total depths for the production wells range from 1,500 to 10,000 feet bgs, and reinjection well depths are expected to be from 1,500 to 9,500 feet bgs.

#### *Direct Impacts*

Direct impacts on water resources associated with construction and operation of the power plant, substation, switching station, transmission lines, pipelines, roads, and well pads would be similar to those discussed previously for the SPPC Project Area. These potential effects include spills of petroleum products on the ground used during construction operations; and erosion or sedimentation from construction activities. These potential impacts on surface water and groundwater resources would be temporary, and would coincide with the construction phase of the project.

Drilling activities require fuels and drilling additives. Spills or releases of petroleum or chemical compounds are potential sources of contamination to

surface water and shallow groundwater. All machinery, drilling platforms, and oil and fuel storage areas on the drill pads would have secondary containment capacity of as much as 110 percent of volume and, as a secondary precaution, would drain to the reserve pit. Ormat proposes to dispose of drill cuttings, drilling fluids, storm water runoff, and geothermal water from flow tests into an unlined reserve pit located at each well pad. The pit would be approximately 100 feet long by 300 feet wide by 8 feet deep. The rationale for using unlined pits is that the low-permeability drilling mud would form a low-permeability layer along the bottom of the pit and serve as a liner, preventing or minimizing fluids from infiltrating to the subsurface and possibly to groundwater.

Although the reserve pit design would keep most of the water and other drilling materials in the pit, some of the fluids may percolate through the drilling mud and into the subsurface. Depending on the volume and frequency of fluid discharge to the pits, a large percentage of the fluids would likely evaporate. Quality of fluids that would collect in the reserve pits would vary depending on the amount of each source (i.e., drilling fluids and additives, storm water, and geothermal water). In general, the fluids are expected to be characterized by high total suspended solids and constituents associated with additives, thickeners, and deflocculants, if used. Geothermal water is characterized by elevated TDS, sodium, chloride, calcium, potassium, fluoride, silica, and sulfate. The solids are composed of sediment and small pieces of broken rock, as well as residual mud and clay from the water-based drilling fluid.

Use of reserve pits to contain fluids and drill cuttings would occur on an infrequent and temporary basis (i.e., during the period of well drilling and testing). Once the wells are finished and put into production or other purposes, the reserve pit would no longer be needed, and the pit would be closed by removing any remaining liquids, and removing or burying the cuttings in accordance with applicable regulations.

Figure 3-12 includes a conceptual depiction of the thermal and non-thermal springs and associated groundwater flow systems in the Project Area. As indicated in **Chapter 3, Affected Environment**, hot and warm springs and seeps are indicators of subsurface geothermal activity (Figure 3-12). Extraction and reinjection of geothermal water could impact flows and water quality at these features. Extraction of groundwater from production wells could reduce shallow groundwater levels and interconnected flow to springs/seeps in thermal areas; whereas, reinjection may compensate for such effects. In areas of thermal shallow groundwater, temperatures could be lowered if interconnected flow from deeper zones is reduced. Quality of this shallow groundwater, including springs/seeps, could be improved if high concentrations of some constituents are diluted more by non-thermal shallow groundwater.

Elevated temperature, specific conductance, chloride, and silica concentrations for near-surface groundwater samples collected near the Ormat Project area

are indicative of a deep geothermal source (7Q10 2010; Coolbaugh et al. 2006). Elevated silica, sodium, and chloride concentrations detected in samples from springs in the same area indicate the geothermal reservoir is a source of the surface expressions (Huffman and Carpenter 2009b; Coolbaugh et al. 2006). These thermal springs are generally located in the northwestern end of the Salt Wells Basin, which is east-southeast of the Ormat Project Area and within the northeastern part of the Vulcan Project Area (Figure 3-10). Seasonal variability in water temperature and quality for the samples from shallow groundwater and the springs indicates that precipitation and non-thermal shallow groundwater also contribute to source water in this area.

Flows at non-thermal springs and seeps are not likely to be affected by geothermal groundwater development because these springs are recharged by shallow groundwater with short flow paths that is recharged primarily from precipitation, irrigation, and runoff in the watersheds in mountain ranges and valley bottoms (BLM 2005). Except where there is an interconnection with deep groundwater along faults, geothermal extraction and reinjection are not expected to affect water levels in the shallow unconsolidated aquifers because of the depths at which pumping and extraction would occur (i.e., greater than 1,500 feet). The Carson Lake area does not seem to be influenced by shallow thermal water and, therefore, any surface water in the lake area should not be affected.

If lowering of groundwater levels occurs in some areas of the shallow aquifer where there are springs/seeps, it could result in drier soil conditions and reduced vegetative cover (e.g., wetlands), which could result in increased fugitive dust. Wildlife that accesses surface water features may also be affected if flow in these features is affected by the project.

Ormat is proposing a binary power plant system in which most of the extracted groundwater would be returned to the geothermal source aquifer via injection wells (Figure 3-12). Therefore, the volume of groundwater in the geothermal source aquifer is not expected to be reduced substantially over the life of the operation. During pumping, however, some groundwater flow paths in the deeper aquifers could be modified.

Long-term pumping of geothermal reservoirs and reductions in temperatures prior to reinjection could reduce pressures within the deeper geothermal system. The magnitude of upward vertical hydraulic gradients could be reduced as a result of depressurization of the system.

Changes in well water levels and flows in springs and other surface water features could impact the ability of water users to exercise their rights. However, as indicated previously, effects on shallow groundwater and springs, if any, would likely occur in the northwestern end of the Salt Wells Basin where these features have been detected. Any water rights for surface water or shallow groundwater as the source outside of this limited area would not likely

be affected by the proposed geothermal pumping. Water rights for deeper groundwater in the Ormat Project Area may be affected by the proposed project due to groundwater withdrawals and possible changes in hydraulic head in the extraction zone. The State Engineer and NDWR would be responsible for determining if such adverse impacts are likely for permitting, and also would respond if complaints about impacts are issued to the agency.

Although the binary system is not expected to consume large volumes of geothermal water, a supply of water would be required to cool the power plant components. The rate of water consumption for cooling is expected to range from 2,500 to 3,500 gpm from April to October (proposed annual extraction period). Ormat proposes to obtain cooling water from the Newlands Project canal which extends through the Project Area. The source of water in the canal is Lahontan Reservoir, which is recharged by the Truckee and Carson rivers. Ormat would purchase water rights from an existing canal water right holder for the necessary amount of consumptive project water. Reduced irrigation flows may reduce some recharge to shallow groundwater that occurs from the irrigation canals, and groundwater quality may be influenced locally from reduced influence of irrigation water.

Wastewater generated at the power plant would be disposed of via an on-site septic system permitted by the State of Nevada. Wastewater may include sanitary water, storm water, and other unidentified sources. Potential impacts on the shallow groundwater system include increased concentrations of nitrate, phosphate, and total dissolved solids. Proper design and operation of the septic system would prevent adverse impacts on groundwater. Potable water for drinking would be provided by a local bottled water company.

Pentane, a low-toxicity flammable solvent, is proposed as the working fluid at the Ormat Binary Power Plant. Approximately 30,000 gallons of pentane would be circulated through the system, and approximately 7,500 gallons would be stored in an on-site tank. A release from the storage tank or distribution system could impact surface water or shallow groundwater quality. However, the tank and distribution system would be located on concrete or lined pads to prevent infiltration of any releases to the environment.

The federal Safe Drinking Water Act amendments of 1996 require states to develop and implement Source Water Assessment Programs to analyze existing and potential threats to the quality of public drinking water. Source water is the groundwater or surface water that provides drinking water for a public water system. NDEP was designated as the lead agency in administering the state of Nevada Source Water Assessment Programs. The Safe Drinking Water Act 1996 amendments require states to delineate areas that are sources of public drinking water, identify potential contaminant sources within the delineated area, assess the water system's susceptibility to contamination, and inform the public of the results. Public drinking water supply systems in the vicinity of the

project area include the city of Fallon, Fallon Naval Air Station, and Fallon golf course (NDEP 2011).

The Safe Drinking Water Act of 1977 authorized the EPA to establish regulations for underground injection control. State of Nevada underground injection control regulations were adopted and became effective in July 1987. NDEP was designated as the lead agency in administering the State underground injection control program, and has authority under Nevada Revised Statutes (NRS) 445A to regulate all classes of injection wells. An underground injection control permit for Class V wells would apply to geothermal injection wells. To obtain an underground injection control permit, the appropriate application forms are submitted to NDEP, Bureau of Water Pollution Control.

#### *Indirect Impacts*

Indirect impacts on water resources associated with construction and operation of the power plant, substation, switching station, transmission lines, pipelines, roads, and well pads would be an overall change in the water budget for the ROI. This is discussed under Direct Impacts, and could include changes in recharge-discharge, evapotranspiration, and groundwater flow systems. Because of the plan to reinject a major portion of the extracted groundwater, the overall change in water budget for the Project Area is expected to be minor. In addition, the proposed annual extraction period for makeup water would only occur from April to October.

#### *Mitigation and Monitoring Measures*

Implementation of a Spill Prevention Contingency and Countermeasure Plan would reduce or eliminate effects of petroleum or chemical releases to the environment. Implementation of a SWPPP would prevent erosion and sedimentation due to storm water effects on disturbed areas. Blow-out prevention equipment would be used to protect the environment during all drilling work.

Mitigation of potential impacts on groundwater, springs, and other surface water features can be addressed by development of monitoring plans for these water resources. The plans would provide for the collection and evaluation of data necessary to document baseline conditions and impacts on the resources (i.e., water quantity, quality, and temperature). Monitoring wells can be installed in different aquifers for measuring water levels and quality characteristics, as necessary or required. Frequency of monitoring would be sufficient to document potential seasonal changes in the resources. Contingencies can be developed (e.g., modification of geothermal pumping rates) to address any potential impacts that may be documented during the monitoring program.

Reserve pits would be monitored during operations to assure that no leakage is occurring to groundwater or surface water resources. The pits would also be properly closed to prevent release of any contaminants to the environment over time.

Due to the importance of ephemeral channels for draining water from the area during snow melt and heavy rain storms, the following mitigation measures will be implemented, to the extent practicable:

- Avoid placement of support structures in channels;
- Use natural channels to continue passing runoff water through the project area, rather than constructing concrete-line channels; and
- Minimize the number of road crossings over channels, and design necessary crossings to provide adequate flow-through during storm events.

#### *Residual Impacts*

Residual impacts that may remain after implementation of mitigation measures would be a change in the overall water budget of the Project Area during geothermal pumping, and for a period of time after termination of pumping until the hydrologic system once again stabilizes. Groundwater levels or pressures in the pumped aquifer may be reduced within the ROI during and after the life of the project due to consumptive demand for water.

#### ***Alternative I (Preferred)***

This Alternative would provide for increased protection of riparian areas and surface water in or near canals by providing Alternative sites for selected wells and pipeline routes. Areas of disturbance would be slightly higher under this scenario. However, the overall degree of impacts on surface water resources would be lower than under the Proposed Action over the lifetime of the Ormat project. Implementation of Alternative I would not affect groundwater beyond that predicted under the Proposed Action. Potential impacts and mitigation and monitoring measures for Alternative I would be similar to those discussed for the Proposed Action.

#### ***No Action Alternative***

Under this scenario, no facilities would be constructed. Therefore, impacts on water resources would not occur, and monitoring and mitigation would not be required.

### **Vulcan Project Area**

#### ***Proposed Action (Preferred)***

Approximately 1,260 acres of temporary disturbance would be developed, and 760 acres of disturbance would be permanent under the Vulcan Proposed Action.

Vulcan is proposing up to four binary power plants at five possible locations. Eight geothermal production and four reinjection wells are planned per binary power plant. At a groundwater temperature of 127°C, each binary power plant would require 18,000 gpm of geothermal water to run efficiently. If higher

groundwater temperatures are available, as many as two of the power plants would be flash power plants. Fourteen geothermal production and seven reinjection wells are planned per flash power plant. Each flash power plant would need a geothermal groundwater flow rate of approximately 22,000 gpm, assuming a water temperature of 182°C.

Up to 20 water supply wells would be required for construction and operation of all proposed power plants. Operation of the power plants would require cooling water sourced from non-thermal groundwater and/or geothermal water. Most makeup water demand is for cooling water, with some additional water needed for dust control, construction activities, and blow-down water.

Estimated consumption rates for water used for cooling purposes are 3,300 ac-ft per year (2,050 gpm) per binary power plant, and 5,500 ac-ft per year (3,400 gpm) per flash power plant. Maximum total water consumption would be 13,300 ac-ft per year (8,200 gpm) for four binary power plants.

#### *Direct Impacts*

Direct impacts on water resources associated with construction and operation of the facilities would be similar to those discussed for the Ormat Project Area. These potential effects include spills of petroleum products on the ground used during construction operations; and erosion or sedimentation from construction activities. These potential impacts on surface water and groundwater resources would be temporary, and would coincide with the construction phase of the project.

Drilling activities require fuels and drilling additives. Vulcan proposes to use on-site fuel tanks with secondary containment at well pads. Spills or releases of petroleum or chemical compounds are potential sources of contamination to surface water and shallow groundwater.

Vulcan proposes to dispose of drill cuttings, drilling fluids, storm water runoff, and geothermal water from flow tests into reserve pits that are lined with local clay material. Each pit would be approximately 200 feet long by 60 feet wide. In addition to the liner of local clay material, the low-permeability drilling mud would form a low-permeability layer along the bottom of the pit, both of which would prevent or minimize fluids from infiltrating to the subsurface and possibly to groundwater.

Although the reserve pit design would keep most of the water and other drilling materials in the pit, some of the fluids may percolate through the clay and mud and into the subsurface. Depending on the volume and frequency of fluid discharge to the pits, a large percentage of the fluids would likely evaporate. Quality of fluids that would collect in the reserve pits would vary depending on the amount of each source (i.e., drilling fluids and additives, storm water, and geothermal water). In general, the fluids are expected to be characterized by high total suspended solids and constituents associated with additives,

thickeners, and deflocculants, if used. Geothermal water is characterized by elevated sodium, chloride, calcium, potassium, fluoride, and sulfate. The solids are composed of sediment and small pieces of broken rock, as well as residual mud and clay from the water-based drilling fluid.

Use of reserve pits to contain fluids and drill cuttings would occur on an infrequent and temporary basis (i.e., during the period of well drilling and testing). Once the wells are finished and put into production or other purposes, the reserve pit would no longer be needed, and the pit would be closed by removing any remaining liquids, and removing or burying the cuttings in accordance with applicable regulations.

Figure 3-12 includes a conceptual depiction of the thermal and non-thermal springs and associated groundwater flow systems in the Project Area. As indicated in **Chapter 3, Affected Environment**, hot and warm springs and seeps are indicators of subsurface geothermal activity (Figure 3-12). Extraction and reinjection of geothermal water could impact flows and water quality at these features. Extraction of groundwater from production wells could reduce shallow groundwater levels and interconnected flow to springs/seeps in thermal areas; whereas, reinjection may compensate for such effects. In areas of thermal shallow groundwater, temperatures could be lowered if interconnected flow from deeper zones is reduced. Quality of this shallow groundwater, including springs/seeps, could be improved if high concentrations of some constituents are diluted more by non-thermal shallow groundwater.

Elevated temperature, specific conductance, chloride, and silica concentrations for near-surface groundwater samples collected in and near the Vulcan Project Area are indicative of a deep geothermal source (7Q10 2010; Coolbaugh et al. 2006). Elevated silica, sodium, and chloride concentrations detected in samples from springs in the same area indicate that the geothermal reservoir is a source of water in the surface expressions (Huffman and Carpenter 2009b; Coolbaugh et al. 2006). These thermal springs are generally located in the northwestern end of the Salt Wells Basin, which is within the northeastern part of the Vulcan Project Area (Figure 3-10). Seasonal variability in water temperature and quality for the samples from shallow groundwater and the springs indicates that precipitation and non-thermal shallow groundwater also contribute to source water in this area.

Flows at non-thermal springs and seeps would likely not be affected by geothermal groundwater development because these springs are recharged by shallow groundwater with short flow paths that is recharged primarily from precipitation, irrigation, and runoff in the watersheds in mountain ranges and valley bottoms (BLM 2005). Except where there is an interconnection with deep groundwater along faults, geothermal extraction and reinjection are not expected to affect water levels in the shallow unconsolidated aquifers because of the depths at which pumping and extraction would occur (i.e., greater than

1,500 feet). The Carson Lake area does not seem to be influenced by shallow thermal water and, therefore, any surface water in the lake area would likely not be affected.

If lowering of groundwater levels occurs in some areas of the shallow aquifer where there are springs/seeps, it could result in drier soil conditions and reduced vegetative cover (e.g., wetlands), which could result in increased fugitive dust. Wildlife that accesses surface water features may also be affected if flow in these features is affected by the project.

Vulcan is proposing two types of power plants: binary system and flash system. However, the flash system design would only be used if sufficient quantity of high temperature geothermal water is available. Each binary power plant would require 18,000 gpm of geothermal water; whereas, each flash power plant would use approximately 22,000 gpm. Wells drilled for flash power plant use would be deeper than those completed for binary power plants. A greater amount of pumped groundwater would be reinjected for the binary system as compared to the flash system. Groundwater reinjection wells may be drilled to recharge the aquifer at depths other than those from which the water was obtained.

As indicated previously, water consumption rates for cooling are approximately 3,300 ac-ft per year (2,050 gpm) per binary power plant, and 5,500 ac-ft per year (3,400 gpm) per flash power plant. Additional supply water will be needed for dust control and revegetation during construction and reclamation of disturbed areas. Up to 20 wells would supply the necessary water for cooling, dust control, and revegetation; one potential groundwater source is a zone of cold water documented at 750 feet bgs near exploration well 58-9 which is located in the Vulcan lease area (Sec. 9, T17N, R30E) (**Chapter 2**). Vulcan may also use water purchased from the irrigation district or from private parties to supplement water needs.

Groundwater pumped from wells for cooling water, dust control, and revegetation would lower groundwater levels and/or pressures in the affected aquifer. Pumping rates of several thousand gpm from the aquifer, which is expected to be at a depth of approximately 750 feet bgs, could lower groundwater levels in the near-surface water table if it is hydraulically connected to the pumped aquifer. If any irrigation water is used for geothermal project water supply needs, reduced irrigation flows may reduce some recharge to shallow groundwater that occurs from the irrigation canal.

As a result of water consumption, the volume of groundwater in the geothermal source aquifer would be reduced over the life of the operation. Greater water consumption would occur with the flash system. In addition, some groundwater flow paths in the deeper aquifers could be modified during pumping.

Long-term pumping of geothermal reservoirs and reductions in temperatures prior to reinjection could reduce pressures within the deeper geothermal system. Magnitude of upward vertical hydraulic gradients could be reduced as a result of depressurization of the system.

Changes in well water levels and flows in springs and other surface water features could affect the ability of water users to exercise their rights. However, as indicated previously, effects on shallow groundwater and springs, if any, would likely occur in the northwestern end of the Salt Wells Basin where these features have been detected. Any water rights for surface water or shallow groundwater as the source outside of this limited area would not likely be affected by the proposed geothermal pumping. Water rights for deeper groundwater in the Vulcan Project Area may be affected by the proposed project due to groundwater withdrawals and possible changes in hydraulic head in the extraction zone. The State Engineer and NDWR would be responsible for determining if such adverse impacts are likely for permitting, and also would respond if complaints about impacts are issued to the agency.

Wastewater generated at the power plants would likely be disposed of via an on-site septic system permitted by the State of Nevada. Wastewater may include sanitary water, storm water, and other unidentified sources. Potential impacts on the shallow groundwater system include water quality changes such as increased concentrations of nitrate, phosphate, and TDS. Proper design and operation of the septic system would prevent adverse impacts on groundwater.

The boundary between the intermediate and deep aquifers in the Project Area ranges from 500 to 1,000 feet bgs (Maurer et al. 1996). Therefore, cooling water obtained from groundwater at depths of about 750 feet would be in the intermediate aquifer. Injection water would be pumped into the deep aquifer. Water level elevations in wells indicate there is a direct hydraulic connection between the shallow and intermediate aquifers, with a lesser connection between the intermediate and deep aquifers (Maurer et al. 1996).

#### *Indirect Impacts*

Indirect impacts on water resources associated with construction and operation of the power plants, substations, switching station, transmission lines, pipelines, roads, and well pads would be an overall change in the water budget for the ROI. This is discussed under Direct Impacts, and could include changes in recharge-discharge, evapotranspiration, and groundwater flow systems. Because of the plan to reinject a major portion of the extracted groundwater, the overall change in water budget for the Project Area is expected to be minor.

#### *Mitigation and Monitoring Measures*

Implementation of a Spill Prevention Contingency and Countermeasure Plan would reduce or eliminate effects of petroleum or chemical releases to the environment. Blow-out prevention equipment would be used to protect the environment during all drilling work. Implementation of a SWPPP would prevent

erosion and sedimentation due to storm water effects on disturbed areas. Berms would be constructed around all drill pads to prevent runoff from leaving the site.

Mitigation of potential impacts on groundwater, springs, and other surface water features can be addressed by development of monitoring plans for these water resources. The plans would provide for the collection and evaluation of data necessary to document baseline conditions and impacts on the resources (i.e., water quantity, quality, and temperature). Monitoring wells can be installed in different aquifers for measuring water levels and quality characteristics, as necessary or required. Frequency of monitoring would be sufficient to document potential seasonal changes in the resources. Contingencies can be developed (e.g., modification of geothermal pumping rates) to address any potential impacts that may be documented during the monitoring program.

Reserve pits would be monitored during operations to be sure that no leakage is occurring to groundwater or surface water resources. The pits would also be properly closed to prevent release of any contaminants to the environment over time.

Due to the importance of ephemeral channels to drain water from the area during snow melt and heavy rain storms, the following mitigation measures will be implemented, to the extent practicable:

- Avoid placement of support structures in channels;
- Use natural channels to continue passing runoff water through the project area, rather than constructing concrete-line channels; and
- Minimize the number of road crossings over channels, and design necessary crossings to provide adequate flow-through during storm events.

#### *Residual Impacts*

Residual impacts that may remain after implementation of mitigation measures would be a change in the overall water balance of the Project Area during geothermal pumping, and for a period of time after termination of pumping until the hydrologic system once again stabilizes. Groundwater levels or pressures in the pumped aquifer would be reduced within the ROI during and after the life of the project due to consumptive use of water.

#### ***Alternative I***

This Alternative would cause an additional 173 acres of temporary disturbance and 76 acres of permanent disturbance due to construction of a switching station and extension of a power transmission line. If this Alternative is implemented, the types of impacts and mitigation and monitoring measures would be similar to those discussed for the Proposed Action.

**No Action Alternative**

Under this scenario, no facilities would be constructed. Therefore, impacts on water resources would not occur, and monitoring and mitigation would not be required.

**4.8 FLOODPLAINS, WETLANDS AND RIPARIAN ZONES****Summary****Assessment Methodology**

As described in **Section 3.8**, a wetland delineation was conducted for the Eightmile Flat portion of the Vulcan Project Area (Huffman and Carpenter 2009), and a wetland assessment was completed for the Ormat Project Area (Great Basin Ecology 2008). In addition, the BLM conducted a field visit to determine the extent of riparian vegetation adjacent to the irrigation canal within the Ormat Project Area. Data from these assessments were used to determine the extent of floodplains, wetlands, and riparian areas present in the Project Areas and potentially impacted by the Proposed Actions or Alternatives.

**Indicators**

Indicators for effects on floodplains, wetlands, and riparian zones include the following:

- Acres of playas and seasonal wetlands located within the Salt Wells Energy Projects Area that may be disturbed by the Proposed Actions and Alternatives;
- Projected frequency, extent, and duration of flooding as a result of storm water runoff; or
- Alteration of surface water or stormwater flows.

It is assumed that the acres of seasonal wetlands that may be disturbed and the alteration of surface water are likely tied to variations in subsurface water levels.

**Region of Influence**

The ROI for direct effects includes the SPPC, Ormat, and Vulcan Project Area, and for indirect effects includes the Carson Lake Area and the Salt Wells Basin.

**SPPC Project Area****Proposed Action***Direct Impacts*

Acres of wetland vegetation that would be affected by the SPPC Project are presented in **Table 4-7**, Comparison of Perennial Wetland Impacts by SPPC Alternative. The SPPC Proposed Action crosses wet meadows west of the L-12 canal. Construction of a transmission line in these areas could cause direct

effects on wetland areas including permanent removal of wetland vegetation. Vegetation clearing could decrease the suitability of the wet meadow areas for wildlife, and ground disturbance could increase erosion and sedimentation to nearby canals and other wetland areas, such as the Carson Lake and Pasture. Spills of hazardous construction materials could contaminate the wetland, killing the vegetation and lowering the water quality.

SPPC would minimize development in and near wet meadows to the extent feasible. Furthermore, a Stream, Wetland, Well, Spring, and Canal Protection Plan, Spill Prevention Control Plan, and Erosion Control Plan would be developed and implemented as part of the POD.

**Table 4-7**  
**Comparison of Perennial Wetland Impacts by SPPC Alternative**

|                   | <b>Proposed<br/>Action</b> | <b>Alternative 1</b> | <b>Alternative 2</b> | <b>Alternative 3</b> | <b>Macari Fiber<br/>Optic<br/>Alternative</b> |
|-------------------|----------------------------|----------------------|----------------------|----------------------|---|
| Temporary Impacts | 37                         | 98                   | 32                   | 32                   | 0   |
| Permanent Impacts | 14                         | 39                   | 13                   | 13                   | 0   |

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Sources: SWReGAP 2010, BLM 2010

A portion of the proposed SPPC Project Area is within the 100-year floodplain. Neither the Proposed Action nor any of the Alternatives would alter the boundaries of the 100-year floodplain or change elevations that would affect flooding. SPPC would take all possible steps to avoid placing transmission towers within areas prone to flash floods. In areas where placing transmission towers in the floodplain or in flash flood areas is unavoidable, SPPC would retain a geotechnical engineer to design appropriate protective measures for towers at risk. Examples of such protective measures include reinforcing the tower bases and constructing earthen berms to divert water around the towers.

#### *Indirect Impacts*

Vegetation removal in the wet meadow areas could allow for the introduction or spread of invasive, nonnative species, causing impacts as described in **Section 4.10, Invasive, Nonnative Species**.

#### *Mitigation and Monitoring Measures*

Implementation of the POD and associated protection plans as well as Environmental Protection Measures for facilities within the floodplain would reduce impacts on wetlands, riparian zones, and floodplains (**Appendix E**). Additional mitigation measures would be necessary to reduce impacts:

A wetland delineation of wet meadows associated with the Newlands canals would be conducted to determine the boundaries, acreage, and types of wetlands that could be affected by the Proposed Action. The project proponent would comply with any mitigation measures determined by the USACE to ensure no net loss of wetlands.

Sediment and erosion control BMPs would be implemented in accordance with state and local guidelines, including filter fencing, coir logs, etc., as needed;

Construction within any wet meadow areas would be conducted when relatively dry conditions exist, in order to minimize soil erosion and potential impacts on vegetation and wildlife;

There would be the ability to deploy standby sediment control BMPs, as needed, to protect all exposed portions of the site within 48 hours of a predicted storm event (a predicted storm event is defined as a National Weather Service forecasted, 50 percent chance of rain);

Slopes along the roadways would be revegetated with native or suitable species as appropriate; and

The SPPC would obtain and comply with provision of a State of Nevada Section 401 Water Quality Certification permit.

#### *Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of the Proposed Action.

### ***Alternative I***

#### *Direct Impacts*

The types of direct impacts on wetlands, riparian zones, and floodplains from Alternative I would be similar to those described for the Proposed Action. However, Alternative I would cause permanent impacts on over two and a half times more perennial wetland compared to the Proposed Action.

#### *Indirect Impacts*

Indirect impacts on wetlands, riparian zones, and floodplains from Alternative I would be similar to those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures described for the Proposed Action would be needed for Alternative I to reduce impacts on wetlands, riparian zones, and floodplains.

#### *Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of Alternative I.

**Alternative 2***Direct Impacts*

The types and size of direct impacts on wetlands, riparian zones, and floodplains from Alternative 2 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on wetlands, riparian zones, and floodplains from Alternative 2 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures described for the Proposed Action would be needed for Alternative 2 to reduce impacts on wetlands, riparian zones, and floodplains.

*Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of Alternative 2.

**Alternative 3 (Preferred)***Direct Impacts*

The types and size of direct impacts on wetlands, riparian zones, and floodplains from Alternative 3 would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on wetlands, riparian zones, and floodplains from Alternative 3 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures described for the Proposed Action would be needed for Alternative 3 to reduce impacts on wetlands, riparian zones, and floodplains.

*Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of Alternative 3.

**Macari Fiber Optic Alternative***Direct Impacts*

Due to its small acreage and lack of wetlands, riparian zones, and floodplains within the footprint, direct impacts on wetlands, riparian zones, and floodplains are not expected as a result of the Macari Fiber Optic Alternative.

*Indirect Impacts*

Due to its small acreage and distance from wetlands, riparian zones, and floodplains, indirect impacts on wetlands, riparian zones, and floodplains are not expected as a result of the Macari Fiber Optic Alternative.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed to reduce impacts on wetlands, riparian zones, and floodplains for the Macari Fiber Optic Alternative.

*Residual Impacts*

Residual impacts on wetlands, riparian zones, and floodplains are not expected as a result of the Macari Fiber Optic Alternative.

**No Action Alternative**

No impacts on wetlands, riparian zones, or floodplains would occur with implementation of the No Action Alternative.

**Ormat Project Area*****Proposed Action****Direct Impacts*

As described in Section 3.8, a wetland vegetation assessment was conducted for the Ormat Project Area. Acres of wetland vegetation that would be affected by the Ormat Project are presented in **Table 4-8**, Comparison of Wetland Impacts by Ormat Alternative. The Ormat Project could affect seasonal wetlands, including wet meadows and playas. Vegetation removal is less of a concern with playa wetlands, as they are sparsely vegetated. However, building in these areas could make them less suitable for wildlife use both temporarily and permanently. Ground disturbance could cause erosion and sedimentation into nearby wetlands. Spills of hazardous construction materials could contaminate the playa and lower the water quality. The pipeline crossing of the canal along Macari Lane would avoid the toe on either side of the canal and would be high enough to allow for continued Reclamation operation and maintenance activities.

Ormat would minimize development in and near playas to the extent feasible. Furthermore, a Stream, Wetland, Well, Spring, and Canal Protection Plan, Erosion Control Plan, and Spill Prevention Control Plan would be developed and implemented as part of the POU.

**Table 4-8**  
**Comparison of Wetland Impacts by Ormat Alternative**

| Wetland Type      | Temporary Impacts (acres) |               | Permanent Impacts (acres) |               |
|-------------------|---------------------------|---------------|---------------------------|---------------|
|                   | Proposed Action           | Alternative I | Proposed Action           | Alternative I |
| Perennial wetland | 38                        | 25            | 18                        | 9             |
| Playa             | 50                        | 62            | 31                        | 41            |

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.  
Source: SWReGAP 2010, BLM 2010

A portion of the proposed Ormat Project is within the 100-year floodplain. The project would not alter the boundaries of the 100-year floodplain or change elevations that would affect flooding. Ormat would take all possible steps to avoid placing facilities within areas prone to flash floods. In areas where placing facilities in the floodplain or in flash flood areas is unavoidable, Ormat would retain a geotechnical engineer to design appropriate protective measures for facilities at risk. Examples of such protective measures include reinforcing transmission tower bases and constructing earthen berms to divert water around facilities.

No direct effects on riparian zones are expected from the Ormat Project.

#### *Indirect Impacts*

The proposed wells U and V, as well as the associated pipeline, are within perennial wetlands along the L-12 canal. Construction of these wells could cause erosion and subsequent sedimentation of the nearby wetland. Ormat would develop and implement an erosion control plan as part of the POU to reduce impacts.

#### *Mitigation and Monitoring Measures*

The mitigation measures described for the SPPC Project would be adapted and implemented for the Ormat Project to reduce impacts on wetlands, riparian zones, and floodplains. In addition, water monitoring plans would be implemented.

#### *Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of the Proposed Action.

#### **Alternative I (Preferred)**

##### *Direct Impacts*

The types of direct impacts on wetlands, riparian zones, and floodplains from Alternative I would be similar to those described for the Proposed Action. Under Alternative I, wells U and V and the associated pipeline were relocated

outside of the wetland vegetation, causing nine fewer acres of permanent impacts on perennial wetlands compared to the Proposed Action. However, Alternative I would cause an additional ten acres of permanent impacts on seasonal playa wetlands.

#### *Indirect Impacts*

Although wells U and V and the associated pipeline would be outside of perennial wetlands, Alternative I could still have indirect effects on nearby wetlands. As such, indirect impacts on wetlands from Alternative I would be similar to those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures described for the Proposed Action would be needed for Alternative I to reduce impacts on wetlands, riparian zones, and floodplains.

#### *Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains are not expected with implementation of Alternative I.

#### **No Action Alternative**

No impacts on wetlands, riparian zones, or floodplains would occur with the No Action Alternative.

### **Vulcan Project Area**

#### ***Proposed Action (Preferred)***

#### *Direct Impacts*

As outlined in Section 3.8, an assessment of the perennial wetlands was conducted for the Vulcan Project Area, and the Proposed Action was developed to avoid perennial wetlands to the extent feasible. Impacts on playas from the Vulcan Project would be similar to those described under the Ormat Project. A greater acreage of playa would be affected by the Vulcan Project. Acres of wetlands that would be impacted by the Vulcan Project are presented in **Table 4-9**, Comparison of Wetland Impacts by Vulcan Alternative.

**Table 4-9**  
**Comparison of Wetland Impacts by Vulcan Alternative**

| <b>Wetland Type</b> | <b>Temporary Impacts (acres)</b> |               | <b>Permanent Impacts (acres)</b> |               |
|---------------------|----------------------------------|---------------|----------------------------------|---------------|
|                     | Proposed Action                  | Alternative I | Proposed Action                  | Alternative I |
| Seasonal wetland    | 11                               | 11            | 7                                | 7             |
| Playa               | 203                              | 221           | 120                              | 128           |

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.  
Source: SWReGAP 2010, Huffman and Carpenter 2009

Vulcan would minimize development in and near playas to the extent feasible. Furthermore, a Stream, Wetland, Well, Spring, and Canal Protection Plan, Erosion Control Plan, and Spill Prevention Control Plan would be developed and implemented as part of the POU/POD.

No direct effects to floodplains or riparian zones are expected from the Vulcan Project.

#### *Indirect Impacts*

Operation of the Vulcan Project would use geothermal waters that likely recharge the thermal springs within the Vulcan Project Area. The project could impact flows and water quality in these areas, as described in **Section 4.7, Water Quality and Quantity**. Seasonal and perennial wetlands associated with these springs and water sources could be affected. Without this source of water, seasonal and perennial wetlands could become drier or completely dry, and thus would not be able to support the wetland vegetation established in these areas. Over time, vegetation composition would likely change to correspond with the reduction in water. In addition, a change in water quality could affect the composition of the vegetation community, potentially allowing the continued conversion to nonnative species, such as canary reedgrass and tamarisk.

In addition, fill of playa wetlands for roads and well pads could alter the flow of water across Eightmile Flat. Since the main source of water for this area comes from precipitation, and water generally does not infiltrate well, there is a lot of runoff, particularly through ephemeral drainages. Filling these drainages and the associated playa could alter how water flows across the site over time and change the hydrological characteristics of portions of Eightmile Flat.

#### *Mitigation and Monitoring Measures*

Except for the wetland delineation requirement and water monitoring plan, mitigation measures described for the SPPC Project would be adapted and implemented for the Vulcan Project to reduce impacts on wetlands, riparian zones, and floodplains. Since the wetlands within the Vulcan Project Area are considered isolated and not Waters of the US, a wetland delineation and permit from the USACE would not be required for this project.

#### *Residual Impacts*

Potential permanent loss of perennial and seasonal wetlands associated with dewatering of springs would be a residual impact of the Vulcan Project.

### ***Alternative I***

#### *Direct Impacts*

The types of direct impacts on wetlands, riparian zones, and floodplains from Alternative I would be similar to those described for the Proposed Action. Impacts on seasonal wetlands (dominated by salt grass) would be the same as

those for the Proposed Action. However, Alternative I would cause permanent impacts on 7 percent more playa compared with the Proposed Action.

#### *Indirect Impacts*

Indirect impacts on wetlands, riparian zones, and floodplains from Alternative I would be similar to those described for the Proposed Action. Indirect impacts on Eightmile Flat could be greater for Alternative I due to the larger extent of temporary and permanent impacts on playa wetlands.

#### *Mitigation and Monitoring Measures*

Mitigation measures described for the Proposed Action would be needed for Alternative I to reduce impacts on wetlands, riparian zones, and floodplains.

#### *Residual Impacts*

Residual impacts on wetlands, riparian zones, or floodplains from Alternative I would be similar to those described for the Proposed Action.

#### **No Action Alternative**

No impacts on wetlands, riparian zones, or floodplains would occur with the No Action Alternative.

## **4.9 VEGETATION**

### **Summary**

#### ***Assessment Methodology***

Characterization of the vegetation communities was based on surveys conducted of the Salt Wells Energy Projects Area during May and June 2010 (Figures 3-18 through 3-20) and on the SWReGAP data.

#### ***Indicators***

Indicators for vegetation resources focus on the acreage of vegetative community disturbance and include the following:

- Effect on a plant species, habitat, or plant community recognized for ecological, scientific, recreational, or commercial importance;
- Effect on a species, habitat, or plant community that is specifically recognized as biologically significant in local, state, or federal policies, statutes, or regulations; or
- Destruction or extensive alteration of habitats or vegetation communities in such a way that would render them uninhabitable to native species.

#### ***Region of Influence***

The ROI for direct and indirect effects on vegetation includes the biological survey area for each project. This includes the defined project footprint of each

project facility as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

## **SPPC Project Area**

### ***Proposed Action***

#### *Direct Impacts*

The SPPC Project would cause the permanent removal of vegetation during construction associated with the Bass Flat and Pony Express Switching Stations, structures associated with the 22 miles of transmission lines and electric line folds, and the Greenwave Substation (**Table 4-10**, Comparison of Temporary Disturbance to Vegetation by SPPC Alternative, and **Table 4-11**, Comparison of Permanent Disturbance to Vegetation by SPPC Alternative). Temporary removal of vegetation would occur during construction associated with temporary access roads, stringing sites, and staging areas. To reduce the likelihood of permanent impacts, vegetation would be cut at ground level to leave the root systems of existing vegetation intact; this would improve soil stabilization and regrowth. Areas with temporary impacts would be recontoured, decompacted, and seeded, if necessary, using a BLM-approved seed mix. Furthermore, the project proponent would create a Reclamation and Habitat Restoration plan, including success criteria for revegetation, to ensure revegetation of temporarily impacted areas. A worker environmental awareness program would be implemented to educate on-site workers on how to protect vegetation.

No direct effects on vegetation are anticipated from operation and maintenance of the SPPC Project.

#### *Indirect Impacts*

Soil disturbance, such as from grading and plant removal, could facilitate the introduction or spread of invasive, nonnative species, including noxious weeds. Invasive, nonnative species could out-compete native species for resources such as water, nutrients, light, and space. This could result in a change in the vegetation structure and ecological function of a vegetation community. Invasive, nonnative species can also increase fire frequency, which would eliminate fire-intolerant vegetation and allow for the continued spread of invasive, nonnative species. These types of impacts would be permanent. Indirect effects from operation and maintenance of the SPPC Project would be less than those from construction. Even so, workers and vehicles accessing the site could introduce or spread invasive, nonnative species into the area over time. Impacts from invasive, nonnative species are described in greater detail in **Section 4.10**, Invasive, Nonnative Species.

**Table 4-10**  
**Comparison of Temporary Disturbance to Vegetation by SPPC Alternative<sup>1</sup>**

| <b>Vegetation Community<sup>2</sup></b>        | <b>Proposed Action (acres)</b> | <b>Alternative 1 (acres)<sup>3</sup></b> | <b>Alternative 2 (acres)</b> | <b>Alternative 3 (acres)</b> | <b>Macari Fiber Optic Alternative (acres)</b> |
|--|--------------------------------|--|------------------------------|------------------------------|---|
| Greasewood flat                                | 160                            | 174<br>(+9%)                             | 159<br>(-1%)                 | 157                          | 1   |
| Mixed salt desert scrub                        | 213                            | 223<br>(+5%)                             | 213<br>(0%)                  | 201                          | 0   |
| Playa  | 6                              | 6<br>(0%)                                | 6<br>(0%)                    | 6                            | 0   |
| Emergent marsh and wet meadow                  | 37                             | 98<br>(+165%)                            | 32<br>(-14%)                 | 22                           | 0   |
| Agriculture and developed                      | 388                            | 322<br>(-17%)                            | 393<br>(+1%)                 | 397                          | 0   |
| Invasive                                       | 1                              | 4<br>(+400%)                             | 1<br>(0%)                    | 1                            | 0   |
| Big Sagebrush shrubland                        | 0                              | 0  | 0                            | 1                            | 0   |
| Inter-Mountain Basins Semi-Desert Shrub Steppe | 0                              | 0  | 0                            | 8                            | 0   |

<sup>1</sup> Total acreages may not match those stated in Chapter 2 due to inaccuracies within the SWReGAP data.

<sup>2</sup> Note that riparian and active and stabilized dune habitat types were not mapped within the SWReGAP.

<sup>3</sup> Percentages indicate the percent change compared to the Proposed Action.

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Source: SWReGAP 2010, BLM 2010

Soil disturbance could also cause the loss of soil nutrients and topsoil through erosion. This could make on-site revegetation with native species unsuccessful and increase the likelihood that invasive nonnative species could invade and spread. Furthermore, soil compaction caused by vehicles and workers on site could reduce water infiltration and make revegetation efforts unsuccessful. Effects would be permanent and would be exacerbated by the disturbances to biological soil crusts, which are widespread in the SPPC Project Area along the east side of the Bunejug Mountains. Biological soil crusts are known to have many important ecological functions, such as stabilizing soils, increasing water filtration, increasing soil carbon and nitrogen fixation, improving germination of native species, limiting germination of invasive, nonnative species, and increasing plant survival and nutrient content (US DOI 2001). While biological soil crusts can recover to some extent several years after disturbance, the full recovery

**Table 4-11**  
**Comparison of Permanent Disturbance to Vegetation by SPPC Alternative<sup>1</sup>**

| <b>Vegetation Community<sup>2</sup></b> | <b>Proposed Action (acres)</b> | <b>Alternative 1 (acres)<sup>3</sup></b> | <b>Alternative 2 (acres)</b> | <b>Alternative 3 (acres)</b> | <b>Macari Fiber Optic Alternative (acres)</b> |
|---|--------------------------------|--|------------------------------|------------------------------|---|
| Greasewood flat                         | 63                             | 80<br>(+27%)                             | 74<br>(+17%)                 | 67                           | 1   |
| Mixed salt desert scrub                 | 95                             | 100<br>(+5%)                             | 95<br>(0%)                   | 83                           | 0   |
| Playa                                   | 2                              | 2<br>(0%)                                | 2<br>(0%)                    | 2                            | 0   |
| Emergent marsh and wet meadow           | 14                             | 39<br>(+179%)                            | 13<br>(-7%)                  | 11                           | 0   |
| Agriculture and developed               | 165                            | 134<br>(-19%)                            | 165<br>(0%)                  | 169                          | 0   |
| Invasive                                | 0                              | 2<br>(+200%)                             | 0<br>(0%)                    | 0                            | 0   |

<sup>1</sup> Total acreages may not match those stated in Chapter 2 due to inaccuracies within the SWReGAP data.

<sup>2</sup> Note that riparian and active and stabilized dune habitat types were not mapped within the SWReGAP.

<sup>3</sup> Percentages indicate the percent change compared to the Proposed Action.

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Source: SWReGAP 2010, BLM 2010

rate is unknown but could take several hundred years (US DOI 2001). As a result, disturbance to biological soil crusts could have wide-ranging effects on vegetation communities over time.

Dust during construction could cover existing vegetation, which could affect plant photosynthesis and respiration. Impairment of these functions could lower plant vigor, growth rate, and increase a plant's susceptibility to disease, causing permanent effects.

An invasive, nonnative species management plan and dust control plan would be developed as part of the POD and would help minimize indirect impacts on vegetation. Furthermore, since dust storms are common in the area, the temporary impacts from project construction may not be greater than the existing conditions. Areas with temporary impacts would be decompacted to improve water infiltration and revegetation efforts. Applicable BMPs (**Appendix E**) include measures to set aside topsoil, reduce soil compaction, prevent the spread or introduction of invasive, nonnative species, and minimize impacts on sensitive vegetation, such as perennial or seasonal wetlands. In addition, the worker environmental awareness program would educate on-site workers

regarding how to prevent the introduction and spread of invasive, nonnative species.

#### *Mitigation and Monitoring Measures*

The aridity of the desert lowers the resilience of many land areas when disturbed, thus reducing revegetation success and potentially allowing for weed invasion and causing permanent loss of ecological function. As such, regular vegetation monitoring and adaptive management measures would be included as part of the revegetation plan. In addition, while the boundary of wetland vegetation associated with Newlands canals was determined, a formal wetland delineation has not been conducted. As such, a wetland delineation of wet meadows associated with the Newlands canals would be conducted to determine the boundaries, acreage, and types of wetlands that could be affected by the proposed project. The SPPC Project would comply with any mitigation measures determined by the USACE to ensure no net loss of wetlands.

No additional mitigation would be necessary, since revegetation, invasive, nonnative species management, and dust control plans would be implemented as part of the POD.

#### *Impact Summary*

Vegetation communities affected by the project are locally and regionally common. Most impacts would occur on agricultural lands, which contain low species diversity and few native plants. However, the Proposed Action would remove wet meadow vegetation, which is less common and regionally important; implementation of the mitigation measure would reduce this impact. Temporary removal of other native vegetation communities such as greasewood flat and mixed salt desert scrub would not make them permanently uninhabitable to native species since impacted areas would be revegetated after construction is complete. Agricultural and developed communities would readily be restored and would likely be in production within one year of construction.

#### *Residual Impacts*

After revegetation and with implementation of plans in the POD, residual impacts on vegetation would be temporary until the affected vegetation communities become reestablished. If revegetation efforts were unsuccessful, this would be a permanent residual impact and could require additional mitigation measures. Furthermore, if temporary roads are not successfully reclaimed, increased OHV use of the area could occur, causing additional vegetation effects (see Section 4.19).

### **Alternative I**

#### *Direct Impacts*

Direct impacts on vegetation from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 49

acres of temporary and 33 acres of permanent disturbance to vegetation compared to the Proposed Action..

*Indirect Impacts*

Indirect impacts on vegetation from Alternative 1 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative 1 would be the same as under the Proposed Action.

*Residual Impacts*

Residual impacts on vegetation from Alternative 1 would be similar to those described for the Proposed Action.

**Alternative 2**

*Direct Impacts*

Direct impacts on vegetation from Alternative 2 would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on vegetation from Alternative 2 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative 2 would be the same as under the Proposed Action.

*Residual Impacts*

Residual impacts on vegetation from Alternative 2 would be similar to those described for the Proposed Action.

**Alternative 3 (Preferred)**

*Direct Impacts*

Direct impacts on vegetation from Alternative 3 would be similar to those described for the Proposed Action. Alternative 3 would cause an additional 7 acres of temporary disturbance and 3 acres of additional permanent disturbance.

*Indirect Impacts*

Indirect impacts on vegetation from Alternative 3 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative 3 would be the same as under the Proposed Action.

*Residual Impacts*

Residual impacts on vegetation from Alternative 3 would be similar to those described for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

The types of direct impacts on vegetation from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited area of temporary (7 acres) and permanent (5 acres) disturbance, direct impacts would be minimal.

*Indirect Impacts*

The types of indirect impacts on vegetation from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited area of temporary and permanent acreage that would be disturbed, indirect impacts would be minimal.

*Mitigation and Monitoring Measures*

No mitigation measures would be needed for vegetation under the Macari Fiber Optic Alternative.

*Residual Impacts*

Residual impacts on vegetation from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on vegetation would not occur.

**Ormat Project Area****Proposed Action***Direct Impacts*

The Proposed Action for the Ormat Project would cause the permanent removal of vegetation during construction associated with the Macari Switching Station, structures associated with the 200-foot transmission line and 6.5 mile pipeline, 13 possible well pads, and access roads (**Table 4-12**, Comparison of Vegetation Disturbance by Ormat Alternative). The Carson Lake Binary Power Plant and Substation would be located on disturbed land, dominated by invasive species. Operation of the pipeline would cause permanent disturbance to vegetation due to the footings, which would require vegetation removal, the pipeline's low stature, which would hinder vegetation regrowth, and the need

for constant maintenance, which would continually disrupt vegetation over the life of the project. Temporary removal of vegetation would occur during construction associated with temporary access roads and staging areas. Most temporary and permanent impacts would occur in the greasewood flat community, with fewer impacts in the mixed salt desert scrub and playa communities. Two proposed wells and an associated portion of the pipeline would be located within wet meadow habitat. Measures for reducing direct impacts on vegetation would be the same as those described previously for the SPPC Project.

**Table 4-12**  
**Comparison of Vegetation Disturbance by Ormat Alternative<sup>1</sup>**

| Vegetation Community <sup>2</sup> | Temporary Impacts (acres) |                                    | Permanent Impacts (acres) |                                    |
|-----------------------------------|---------------------------|------------------------------------|---------------------------|------------------------------------|
|                                   | Proposed Action           | Alternative 1 (acres) <sup>3</sup> | Proposed Action           | Alternative 1 (acres) <sup>2</sup> |
| Greasewood flat                   | 234                       | 212<br>(-9%)                       | 162                       | 139<br>(-14%)                      |
| Mixed salt desert scrub           | 19                        | 15<br>(-21%)                       | 13                        | 11<br>(-15%)                       |
| Playa                             | 50                        | 62<br>(+24%)                       | 31                        | 41<br>(+32%)                       |
| Invasive                          | 5                         | 5<br>(0%)                          | 0                         | 0<br>(0%)                          |

<sup>1</sup> Total acreages may not match those stated in Chapter 2 due to inaccuracies within the SWReGAP data.

<sup>2</sup> Note that riparian and active and stabilized dune habitat types were not mapped within the SWReGAP.

<sup>3</sup> Percentages indicate the percent change compared to the Proposed Action.

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Source: SWReGAP 2010, BLM 2010

#### *Indirect Impacts*

Indirect impacts on vegetation from the Ormat Project would be similar to those described previously for the SPPC Project.

#### *Mitigation and Monitoring Measures*

To address the difficulty of revegetation in the desert, regular vegetation monitoring and adaptive management measures would be included as part of the revegetation plan. Mitigation for impacts on vegetation would be the same as those described previously for the SPPC Project.

#### *Impact Summary*

In general, vegetation communities affected by the Ormat Project are locally and regionally common. However, the Proposed Action would remove wet meadow vegetation, which is less common and regionally important. Implementation of the mitigation measure would reduce impacts on wet meadow vegetation.

Direct removal of native vegetation would not likely alter vegetation communities in the area to make them uninhabitable to native species, since impacted areas would be revegetated after construction is complete.

*Residual Impacts*

Residual impacts on vegetation would be the same as those described previously for the SPPC Project.

**Alternative I (Preferred)**

*Direct Impacts*

Direct impacts on vegetation from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause three fewer acres of temporary and two fewer acres of permanent disturbance to vegetation compared to the Proposed Action, particularly to the wet meadow vegetation associated with the Newlands canal (L-12 canal) (Table 4-12).

*Indirect Impacts*

Indirect impacts on vegetation from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for vegetation under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on vegetation from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on vegetation would not occur.

**Vulcan Project Area**

**Proposed Action (Preferred)**

*Direct Impacts*

The Proposed Action for the Vulcan Project would cause the permanent removal of vegetation during construction associated with the four possible power plants, substations, structures associated with the 8 mile transmission line and 19 mile pipeline, 26 possible well pads, and access roads (**Table 4-13, Comparison of Vegetation Disturbance by Vulcan Alternative**). Impacts from the pipeline would be similar to those described for the Ormat Project, but the Vulcan pipeline would be longer, causing greater impacts. Temporary removal of vegetation would occur during construction associated with temporary access roads and staging areas. Most temporary and permanent impacts would occur in the mixed salt desert scrub community, with fewer impacts in the greasewood

flat and playa communities. Measures for reducing direct impacts would be the same as those described previously for the SPPC Project.

**Table 4-13**  
**Comparison of Vegetation Disturbance by Vulcan Alternative<sup>1</sup>**

| Vegetation Community <sup>2</sup> | Temporary Impacts (acres) |                                    | Permanent Impacts (acres) |                                    |
|-----------------------------------|---------------------------|------------------------------------|---------------------------|------------------------------------|
|                                   | Proposed Action           | Alternative 1 (acres) <sup>3</sup> | Proposed Action           | Alternative 1 (acres) <sup>2</sup> |
| Greasewood flat                   | 412                       | 448<br>(+9%)                       | 252                       | 267<br>(+6%)                       |
| Mixed salt desert scrub           | 757                       | 885<br>(+17%)                      | 432                       | 488<br>(+13%)                      |
| Playa                             | 203                       | 221<br>(+9%)                       | 120                       | 128<br>(+7%)                       |
| Seasonal wetland                  | 11                        | 11<br>(0%)                         | 7                         | 7<br>(0%)                          |

<sup>1</sup> Total acreages may not match those stated in Chapter 2 due to inaccuracies within the SWReGAP data.

<sup>2</sup> Note that riparian and active and stabilized dune habitat types were not mapped within the SWReGAP.

<sup>3</sup> Percentages indicate the percent change compared to the Proposed Action.

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Source: SWReGAP 2010, Huffman and Carpenter 2009

Operation of the Vulcan Project would use geothermal waters that likely recharge the thermal springs within the Vulcan Project Area. The project could impact flows and water quality in these areas, as described in **Section 4.7**, Water Quality and Quantity. Seasonal and perennial wetlands associated with these springs and water sources could be affected. Without this source of water, seasonal and perennial wetlands could become drier or completely dry, and thus would not be able to support the wetland vegetation established in these areas. Over time, vegetation composition would likely change to correspond with the reduction in water. In addition, a change in water quality could affect the composition of the vegetation community, potentially allowing the continued conversion to nonnative species, such as canary reedgrass and tamarisk.

#### *Indirect Impacts*

Indirect impacts on vegetation from the Vulcan Project would be similar to those described previously for the SPPC Project.

#### *Mitigation and Monitoring Measures*

To address the difficulty of revegetation in the desert, regular vegetation monitoring and adaptive management measures would be included as part of the revegetation plan. No additional mitigation would be necessary, since revegetation, invasive, nonnative species management, and dust control plans

would be implemented as part of the POU. Since the wetlands within the Vulcan Project Area are isolated and are not Waters of the US, a wetland delineation and permit from the USACE are not required.

#### *Impact Summary*

Vegetation communities affected by the Vulcan Project are locally and regionally common. Direct removal of native vegetation would not likely alter vegetation communities in the area to make them uninhabitable to native species, since impacted areas would be revegetated once construction is complete.

#### *Residual Impacts*

Residual impacts on vegetation within the Vulcan Project would be the same as those described previously for the SPPC Project.

### **Alternative I**

#### *Direct Impacts*

Direct impacts on vegetation from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 173 acres of temporary and 76 acres of permanent disturbance to vegetation compared to the Proposed Action. This additional disturbance would be associated with the construction of the Bass Flat switching station and the 4-mile transmission line extension to this switching station (Table 4-13).

#### *Indirect Impacts*

Indirect impacts on vegetation from Alternative I would be similar to those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures for vegetation under Alternative I would be the same as those described under the Proposed Action.

#### *Residual Impacts*

Residual impacts on vegetation from Alternative I would be similar to those described for the Proposed Action.

### **No Action Alternative**

Under the No Action Alternative, impacts on vegetation would not occur.

## **4.10 INVASIVE, NONNATIVE SPECIES**

### **Summary**

#### **Assessment Methodology**

Identification of invasive, nonnative species, including noxious weeds, was based on surveys conducted of the Salt Wells Energy Projects Area during May and June 2010 (Figures 3-18 through 3-20). Noxious weeds were identified

according to the Nevada Department of Agriculture noxious weed list. Impacts were analyzed according to the baseline of existing invasive, nonnative species present within the Projects Area.

### **Indicators**

Indicators for invasive, nonnative species focus on the acreage of disturbed areas and the proximity of existing invasive, nonnative species to the disturbance areas. Indicators to assess potential impacts include the following:

- Invasive, nonnative species and/or noxious weed populations are established or increased; or
- Habitats or vegetation communities are destroyed or altered in such a way that would render them uninhabitable to native species.

### **Region of Influence**

The ROI for direct and indirect effects on invasive, nonnative species includes the three project areas.

## **SPPC Project Area**

### **Proposed Action**

#### *Direct Impacts*

As described previously in **Section 4.9**, Vegetation, soil disturbance and plant removal during construction activities could lead to the introduction and spread of invasive, nonnative species, including noxious weeds. All ground-disturbing activities could facilitate the invasion and spread of invasive, nonnative species. Furthermore, humans and vehicles can inadvertently carry invasive, nonnative seeds on their clothing, shoes, tires, and on the undercarriage of vehicles. Impact acreage for each project is presented in **Table 4-14**, Temporary and Permanent Impact Acreages for Each Project.

**Table 4-14**  
**Temporary and Permanent Impact Acreages for Each Proposed Project**

| <b>Project Name</b>   | <b>Temporary Impacts<br/>(acres)</b> | <b>Permanent Impacts<br/>(acres)</b> |
|-----------------------|--------------------------------------|--------------------------------------|
| SPPC Energy Project   | 789                                  | 329                                  |
| Ormat Energy Project  | 321                                  | 197                                  |
| Vulcan Energy Project | 1,254                                | 750                                  |

Calculations assume acreages and ROW widths as described for temporary and permanent impacts in Chapter 2.

Source: EMPSi 2010

Invasive, nonnative species could out-compete native vegetation for resources such as light, water, nutrients, and space, and change the fire regime. They generally lower biological diversity and provide lower quality habitat for wildlife. Invasive, nonnative species are of concern within the SPPC Project Area since the transmission line is linear and extends for 22 miles; as a result, invasive, nonnative species could spread over this entire area. Tamarisk grows near canals, ditches, and perennial wetlands in the SPPC Project Area and is highly tolerant of high salinity soils, low water tables, wildfires, livestock browsing, and conventional weed controls. It has few natural insect or plant pathogens in the Project Area. While it can provide habitat for wildlife, even BLM-designated sensitive species (e.g., Swainson's hawk), it is considered to be lower quality habitat and a type of undesirable vegetation. Along with Russian knapweed and perennial pepperweed, it is a Nevada noxious weed that occurs in the SPPC Project Area. Given the current establishment of these plants in the area and the extent of the transmission line, disturbance during construction could facilitate their spread. Other invasive, nonnative species, such as cheatgrass or halogeton, could also spread.

Introduction and spread of invasive, nonnative species would be less likely during operation and maintenance of the SPPC Project, but with increased vehicle and human use of the area, invasive, nonnative species would still be a concern.

As part of the POD, an invasive, nonnative species management plan would be implemented to reduce the likelihood for invasion and spread of invasive, nonnative species. The invasive, nonnative species management plan would include prevention measures such as cleaning vehicles at designated wash stations before they are used in the Project Area. In addition, materials free of invasive, nonnative species would be used during construction. Furthermore, a revegetation plan would be implemented to help re-establish native species and eliminate the opportunity for the introduction or spread of invasive, nonnative species. Vegetation removal would be restricted to the minimum amount necessary so as to lessen impacts, and a worker environmental awareness program would be implemented to focus on invasive, nonnative species introduction and spread.

#### *Indirect Impacts*

No indirect impacts on invasive, nonnative species are expected from construction, operation, and maintenance of the SPPC Project.

#### *Mitigation and Monitoring Measures*

No additional mitigation measures are necessary with implementation of the invasive, nonnative species management plan and revegetation plan.

#### *Impact Summary*

With implementation of the revegetation and invasive, nonnative species management plans, construction, operation, and maintenance of the SPPC

Project would be unlikely to establish or increase invasive, nonnative species, and would not destroy or alter habitats to render them uninhabitable to native species.

*Residual Impacts*

No residual impacts are expected from construction, operation, and maintenance of the SPPC Project.

**Alternative 1**

*Direct Impacts*

Direct impacts on invasive, nonnative species from Alternative 1 would be similar to those described for the Proposed Action. Alternative 1 would cause an additional 49 acres of temporary and 33 acres of permanent disturbance compared to the Proposed Action causing a slightly greater likelihood for introduction or spread of invasive, nonnative species.

*Indirect Impacts*

Indirect impacts on invasive, nonnative species from Alternative 1 are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under Alternative 1 with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

No residual impacts are expected from construction, operation, and maintenance of Alternative 1.

**Alternative 2**

*Direct Impacts*

Direct impacts on invasive, nonnative species from Alternative 2 would be to the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on invasive, nonnative species from Alternative 2 are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under Alternative 2 with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

No residual impacts are expected from construction, operation, and maintenance of Alternative 2.

**Alternative 3 (Preferred)***Direct Impacts*

Direct impacts on invasive, nonnative species from Alternative 3 would be similar to those described for the Proposed Action. Alternative 3 would cause an additional 7 acres of temporary and 3 acres of permanent disturbance compared to the Proposed Action causing a slightly greater likelihood for introduction or spread of invasive, nonnative species.

*Indirect Impacts*

Indirect impacts on invasive, nonnative species from Alternative 3 are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under Alternative 3 with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

No residual impacts are expected from construction, operation, and maintenance of Alternative 3.

**Macari Fiber Optic Alternative***Direct Impacts*

The types of direct impacts on invasive, nonnative species from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary (7 acres) and permanent (5 acres) disturbance, direct impacts would be minimal.

*Indirect Impacts*

The types of indirect impacts on invasive, nonnative species from the Macari Fiber Optic Alternative are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under the Macari Fiber Optic Alternative with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

No residual impacts are expected from construction, operation, and maintenance of the Macari Fiber Optic Alternative.

**No Action Alternative**

Under the No Action Alternative, impacts on invasive, nonnative species would not occur.

**Ormat Project Area*****Proposed Action****Direct Impacts*

Direct impacts on invasive, nonnative species from the Ormat Project would be similar to those described previously for the SPPC Project. Vegetation disturbance along the pipeline, as described in **Section 4.9, Vegetation**, would increase the likelihood for the introduction and spread of invasive, nonnative species in this area. The Ormat Project Area is more discrete, so invasive, nonnative species would be less likely to spread over a large area. However, the Ormat Project Area has many known invasive, nonnative species, so further spread of these species or introduction of new invasive, nonnative species is a concern. As described for the SPPC Project, an invasive, nonnative species management plan would reduce the likelihood for the introduction and spread of invasive, nonnative species, and a revegetation plan would help to re-establish native species.

*Indirect Impacts*

No indirect impacts on invasive, nonnative species are expected from construction, operation, and maintenance of the Ormat Project.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary with implementation of the invasive, nonnative species management plan and revegetation plan.

*Impact Summary*

With implementation of the revegetation and invasive, nonnative species management plans, construction, operation, and maintenance of the Ormat Project would be unlikely to establish or increase invasive, nonnative species, and would not destroy or alter habitats to render them uninhabitable to native species.

*Residual Impacts*

No residual impacts on invasive, nonnative species are expected from construction, operation, and maintenance of the Ormat Project.

***Alternative I (Preferred)****Direct Impacts*

Direct impacts on invasive, nonnative species from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause three fewer acres of temporary and two fewer acres of permanent disturbance

to vegetation, causing a slightly lower likelihood for the introduction or spread of invasive, nonnative species.

*Indirect Impacts*

Indirect impacts on invasive, nonnative species from Alternative I are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under Alternative I with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

Residual impacts on invasive, nonnative species from Alternative I are not expected to occur.

**No Action Alternative**

Under the No Action Alternative, impacts on invasive, nonnative species would not occur.

**Vulcan Project Area**

***Proposed Action (Preferred)***

*Direct Impacts*

Direct impacts on invasive, nonnative species from the Vulcan Project would be similar to those described previously for the Ormat Project. Some of the Vulcan Project Area is within undisturbed vegetation communities, including those with biotic crusts, and the Vulcan Project would impact more acres of land, increasing the risk for the introduction of invasive, nonnative species. As described for the SPPC Project, an invasive, nonnative species management plan would reduce the likelihood for the introduction and spread of invasive, nonnative species, and a revegetation plan would help to re-establish native species.

*Indirect Impacts*

No indirect impacts on invasive, nonnative species are expected from construction, operation, and maintenance of the Vulcan Project.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as those described for the SPPC Project.

*Impact Summary*

With implementation of the revegetation and invasive, nonnative species management plans, construction, operation, and maintenance of the Vulcan Project would be unlikely to establish or increase invasive, nonnative species,

and would not destroy or alter habitats to render them uninhabitable to native species.

*Residual Impacts*

No residual impacts on invasive, nonnative species are expected from construction, operation, and maintenance of the Vulcan Project.

**Alternative I**

*Direct Impacts*

Direct impacts on invasive, nonnative species from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 173 acres of temporary and 76 acres of permanent disturbance associated with the construction of the Bass Flat Switching Station and the associated 4-mile transmission line extension to this switching station. This would increase the likelihood of invasive, nonnative species introduction and spread.

*Indirect Impacts*

Indirect impacts on invasive, nonnative species from Alternative I are not expected to occur.

*Mitigation and Monitoring Measures*

No additional mitigation measures are necessary under Alternative I with implementation of the invasive, nonnative species management plan and revegetation plan.

*Residual Impacts*

Residual impacts on invasive, nonnative species from Alternative I are not expected to occur.

**No Action Alternative**

Under the No Action Alternative, impacts on invasive, nonnative species would not occur.

## **4.11 WILDLIFE**

### **Summary**

**Assessment Methodology**

Assessment of wildlife and potential habitat was based on surveys conducted of the Salt Wells Energy Projects Area between May and July 2010 (Figures 3-18 through 3-20) and on the SWReGAP data, NNHP data, and NDOW comment letters and communication.

The construction and operation of the Salt Wells Energy Projects may impact wildlife and their habitat through direct and indirect disturbance and habitat

fragmentation. This may affect migratory patterns of game species, habitat use by wildlife populations, and cause permanent degradation of habitat values. Other direct impacts could result from project components, such as power lines that may change patterns of avian movement to and from Carson Lake and Pasture, increase risk of collision with power lines and increase predation by providing more perching opportunities.

### **Indicators**

The following indicators were developed to evaluate potential impacts on wildlife:

- Effect on a population by substantially reducing its numbers, causing a fish or wildlife population to drop below self-sustaining levels, or causing a substantial loss or disturbance to habitat;
- Interference with the movement of any resident wildlife species, with resident or migratory wildlife corridors, or with the use of native wildlife nursery sites; or
- Conflict with the habitat management strategies of the BLM.

### **Region of Influence**

The ROI for direct and indirect effects on wildlife includes the biological survey area for each project. This includes the defined project footprint of each project facility as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

## **SPPC Project Area**

### **Proposed Action**

Overall, the SPPC Project could cause death or injury to wildlife; disturb species due to lighting, noise, and human presence; degrade, fragment, or convert wildlife habitats; or provide habitat for predators.

### *Direct Impacts*

Construction activities, heavy equipment, and vehicle use on site during construction could directly kill or injure a variety of wildlife species, especially slower-moving species, small animals, species that have subsurface burrows, or ground or shrub-nesting birds. Impacts on birds are described in **Section 4.12, Migratory Birds**.

Mortality or injury from collision with vehicles could occur during operation and maintenance, but this is less likely than during construction, as fewer vehicles would be accessing the site during operation and maintenance. In addition, operation and maintenance activities would occur in areas previously disturbed during construction, making them less likely to serve as wildlife habitat. A wildlife protection plan would be prepared as part of the POD to reduce direct

and indirect impacts on wildlife where feasible during construction and operation of the project.

Construction activities could cause temporary noise disturbance or visual impacts associated with construction noise, human presence, vehicles on site, and night lighting. The effects would occur within and adjacent to the SPPC Project Area. Construction disturbance of wildlife varies by species and by whether wildlife is habituated to particular noises, movements, or other anthropogenic disturbance. For instance, wildlife utilizing the transmission line near the agricultural areas would be more likely habituated to human activities than the transmission line on the northeast side of the Bunejug Mountains (Figure 2-1). Nesting birds, bats, and reptiles are particularly sensitive to human presence and noise. Visual and noise disturbances could cause wildlife to alter their foraging, migration, wintering, and breeding behaviors and avoid suitable habitat within or near the Project Area. In the most extreme case, disturbances could cause animals to abandon their nests, roosts, or territories. Displacement of individuals could increase competition for resources in adjacent habitats, which may or may not be able to support more wildlife. Any change in wildlife behavior associated with visual or noise disturbance could have an energetic cost, making animals more susceptible to disease, predation, or unsuccessful reproductive or foraging efforts.

Construction noise has been documented to cause physiological effects such as increased heart rate, altered metabolism, and a change in hormone balance (Radle 2007). Determining the effect of noise has been complicated because different species and individuals have varying responses (Radle 2007), but it is assumed that at least some species would be impacted. Since construction would occur in small areas over time, not over the entire transmission line at the same time, impacts would be temporary and localized. Animals displaced during construction would be able to return to the area once construction is complete.

Habitat quality could decline through loss, fragmentation, and degradation (e.g., introduction or spread of invasive, nonnative species) caused by project construction. Wildlife would be permanently displaced from the Project Area, preventing them from using the site for foraging, breeding, wintering, and shelter. Acres of temporary and permanent habitat loss are presented in Tables 4-10 and 4-11. Habitat fragmentation is the disruption of large, continuous blocks of habitat into less continuous habitat, for example, by clearing land and converting vegetation from one type to another. These effects generally have less of an impact on wide-ranging species, such as pronghorn antelope, than on species with a small geographic home range, such as ground squirrels. Continuous tracts of fragmented habitat could lead to separating wildlife into smaller populations, potentially making them more vulnerable to predation, drought, or disease, and potentially limiting genetic diversity. While most suitable habitat is a mosaic of vegetation communities and habitat features,

fragmentation would create more edge habitat, which increases predation and the likelihood of invasive, nonnative species invasion, thus lowering the habitat value of the Project Area.

An invasive, nonnative plant species management plan would be implemented to reduce the likelihood for introduction and spread of invasive, nonnative plant species. A majority of the habitats within the SPPC Project Area are already fragmented and disturbed, as most of the acreage that would be impacted is agricultural lands. Even so, wildlife use these agricultural areas as well as the native habitats within the Project Area. Most habitat disturbance would be small compared to the amount of suitable, similar, surrounding habitat.

Lighting and/or noise from operation of the project, particularly the substation and switching stations, could cause wildlife to avoid the Project Area and surrounding areas permanently. If species were to avoid adjacent habitats, actual permanent habitat loss would be greater than the direct loss of habitat caused by the project footprint. Lights would be shielded downward to reduce impacts on the surrounding lands.

Available information is inadequate to predict the extent of impacts on any one species inhabiting areas near the transmission corridor. It is likely that impacts could extend beyond the project footprint due to the extent of the project components (22-mile transmission line and switching stations). However, approximately 50 percent of the proposed facilities would be in agriculturally disturbed areas, with the remaining portion in relatively undisturbed mixed salt desert scrub and greasewood flat vegetation communities.

#### *Indirect Impacts*

The proposed transmission line could provide perching and nesting habitat for corvids or raptors. Over time, this could increase predation on small mammals, reptiles, or other bird species, particularly shorebirds and waterfowl using the nearby Carson Lake and Pasture area. This potential mortality would not be expected to cause any one species to drop below self-sustaining numbers. Impacts on birds are described in **Section 4.12, Migratory Birds**.

#### *Mitigation and Monitoring Measures*

Impacts on wildlife would be reduced through implementation of BMPs. Mitigation measures for birds are described in **Section 4.12, Migratory Birds**. Mitigation measures to reduce wildlife impacts, where feasible, would be detailed in the POD, which would include development of a wildlife protection plan, invasive, nonnative plant species management plan, and revegetation plan.

#### *Impact Summary*

Available information is inadequate to predict the extent of impacts on any one species inhabiting areas near the transmission corridor. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the SPPC Project would cause substantial habitat loss, substantial restriction of

wildlife movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because approximately 50 percent of the project facilities would be located in agriculturally disturbed areas and relatively few acres of native habitat would be lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POD. The POD would be finalized before issuing the condition of approval to proceed with the final project.

#### *Residual Impacts*

Residual impacts on wildlife could include potential permanent avoidance of the Project Area by individuals due to increased development, human presence, and background noise. Greater public access could allow for increased harassment of wildlife. Furthermore, there could be a permanent increase in predation on small mammals, reptiles, or birds, caused by the addition of potential perching and nesting habitat for corvids and raptors. However, with implementation of mitigation measures contained in plans within the POD, no residual impacts leading to substantial population declines for any one species are expected.

### **Alternative 1**

#### *Direct Impacts*

Direct impacts on wildlife from Alternative 1 would be similar to those described for the Proposed Action. Alternative 1 would cause an additional 25 acres of temporary and 11 acres of permanent disturbance to wildlife habitat.

#### *Indirect Impacts*

Indirect impacts on wildlife from Alternative 1 would be similar to those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for wildlife under Alternative 1 would be the same as those recommended for the Proposed Action.

#### *Residual Impacts*

Residual impacts on wildlife from Alternative 1 would be similar to those described for the Proposed Action.

### **Alternative 2**

#### *Direct Impacts*

Direct impacts on wildlife from Alternative 2 would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on wildlife from Alternative 2 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures for wildlife under Alternative 2 would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts on wildlife from Alternative 2 would be similar to those described for the Proposed Action.

**Alternative 3 (Preferred)***Direct Impacts*

Direct impacts on wildlife from Alternative 3 would be similar to those described for the Proposed Action. Alternative 3 would cause an additional 7 acres of temporary and 3 acres of permanent disturbance to wildlife habitat.

*Indirect Impacts*

Indirect impacts on wildlife from Alternative 3 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for wildlife under Alternative 3 would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on wildlife from Alternative 3 would be similar to those described for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts on wildlife from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited area of temporary (7 acres) and permanent (5 acres) disturbance, direct impacts would be minimal compared with the other Alternatives.

*Indirect Impacts*

Indirect impacts on wildlife from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary and permanent disturbance acreage, indirect impacts would be minimal compared with the other Alternatives.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures for wildlife under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts on wildlife from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on wildlife would not occur.

**Ormat Project Area*****Proposed Action****Direct Impacts*

Direct impacts on wildlife from the Ormat Project would be similar to those described previously for the SPPC Project. Impacts within the Ormat Project Area would be more concentrated; despite covering a smaller acreage, these impacts would occur closer together geographically. Acres of temporary and permanent habitat loss are presented in Table 4-12. Pipelines could alter movement for some wildlife species, although most species would likely be able to fly over or pass under them, as the top of the pipelines would be approximately three feet above ground, with a diameter of 12 to 28 inches and leaving 8 to 24 inches of clearance underneath. The pipelines would hiss, which could disrupt some species over its 6.5 mile length. Lighting and noise from project operation could displace individuals inhabiting the areas around the wells (13 possible well pads), power plant, substation, and switching station.

Low-level noise from power plant operation could have permanent effects on wildlife, causing them to avoid the area, or potentially putting chronic stress on animals, affecting their energy budget, reproduction, and long-term survival (Radle 2007). Acoustical cues play a dominant role in sexual communication, territory defense, habitat quality assessment, and predator-prey interactions (Barber et al. 2009a), and may be impacted by low-level noise. Studies have documented substantial changes in foraging and anti-predator behavior, reproductive success, density, and community structure in response to noise (Barber et al. 2009b). However, given the existing noise levels in the area, such as those contributed by roadways, agricultural activities, and NAS Fallon, it is likely that most species in the area are habituated to some amount of chronic noise disturbance.

*Indirect Impacts*

Indirect impacts from construction, operation and maintenance of the Ormat Project would be similar to those described previously for the SPPC Project. Increased raptor and corvid predation would be less of a concern, since the transmission line for the Ormat Project would be only 200 feet long.

*Mitigation and Monitoring Measures*

Impacts on wildlife would be reduced through implementation of BMPs. Mitigation measures to reduce wildlife impacts, where feasible, would be detailed in the POU, which would include development of a wildlife protection plan, invasive, nonnative plant species management plan, and revegetation plan.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Ormat Project would cause substantial habitat loss, substantial restriction of wildlife movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POU. The POU would be finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts on wildlife would be similar to those described for the SPPC Project. However, with implementation of mitigation measures contained in plans within the POU, no residual impacts leading to substantial population declines for any one species are expected.

***Alternative I (Preferred)****Direct Impacts*

Alternative I proposes to locate wells U and V farther away from wetland vegetation that exists next to the canal and the wildlife that this habitat type supports. Therefore, this alternative may incur fewer overall effects from construction activities such as noise and human presence when compared to the Proposed Action. Alternative I would cause three fewer acres of temporary and two fewer acres of permanent disturbance to vegetation compared to the Proposed Action. Other impacts would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on wildlife from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for wildlife under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on wildlife from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on wildlife would not occur.

**Vulcan Project Area*****Proposed Action (Preferred)****Direct Impacts*

In general, direct impacts would be similar to those described previously for the SPPC Project, but the primary habitats affected from the Vulcan Project would be mixed salt desert scrub, greasewood flat, and playa, along with the typical wildlife that these vegetation communities support. The size of the Vulcan Project is large enough (4 possible power plants, 8 miles of transmission lines, 19 miles of pipeline, and 26 possible well pads) that it would temporarily and permanently impact a large amount of native habitat (Table 4-13). Individuals of particular species may be differentially affected.

In particular, pronghorn movement could be affected by the pipelines, due to the pipelines' height (three feet), noise (hissing), temperature (the pipelines are hot), length (19 miles), and spatial distribution (widespread). While the Proposed Action is not located in a pronghorn movement corridor, some pronghorn do use the area, likely moving from the Carson Lake and Pasture to locations northeast of the Vulcan Project Area. Presence of the pipelines could cause pronghorn to permanently alter their preferred movement route, which would likely affect individuals but would not likely impact the entire local pronghorn population.

Furthermore, impacts on playa habitat from pipeline footings, well pads, and access roads could alter drainage patterns, water flow, and infiltration. If this were to change the acreage of seasonal wetlands, wildlife that use this habitat, particularly shorebirds, could be affected because there would be less available habitat. Impacts on wetlands are described in greater detail in **Section 4.8**, Floodplains, Wetlands, and Riparian Zones.

Operation of the Vulcan Project would extract and reinject geothermal water that likely recharges the thermal springs within the Vulcan Project Area. While reinjection is assumed to recharge the springs and cause no net loss to springs and wetlands, the project could impact flows and water quality in these areas, as described in **Section 4.7**, Water Quality and Quantity. Seasonal and perennial wetlands associated with these springs and water sources could be affected. If vegetation composition were to change, a different suite of species would likely utilize affected areas. In addition, a change in water quality could affect vegetation, making the area inhospitable to certain species.

*Indirect Impacts*

Indirect impacts on wildlife from the Vulcan Project would be similar to those described previously for the SPPC Project.

*Mitigation and Monitoring Measures*

Impacts on wildlife would be reduced through implementation of BMPs. Mitigation measures to reduce wildlife impacts, where feasible, would be detailed in the POU, which would include development of a wildlife protection plan, invasive, nonnative plant species management plan, and revegetation plan.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Vulcan Project would cause substantial habitat loss, substantial restriction of wildlife movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POU. The POU would be finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts on wildlife would be similar to those described for the SPPC Project. However, with implementation of mitigation measures contained in plans within the POU, no residual impacts leading to substantial population declines for any one species are expected.

***Alternative I****Direct Impacts*

Direct impacts on wildlife from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 173 acres of temporary and 76 acres of permanent disturbance to wildlife habitat associated with the construction of the Bass Flat Switching Station and the associated 4-mile transmission line extension to this switching station. The transmission line extension could provide additional perching habitat for corvids and raptors, thus increasing predation on their prey species.

*Indirect Impacts*

Indirect impacts on wildlife from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for wildlife under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on wildlife from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on wildlife would not occur.

**4.12 MIGRATORY BIRDS****Summary*****Assessment Methodology***

Assessment of migratory birds and potential habitat was based on surveys conducted of the Salt Wells Energy Projects Area in May through July 2010 (Figures 3-18 through 3-20) and on the SVReGAP data, NNHP data, and NDOW comment letters and communication. BLM-designated sensitive bird species are discussed in this section.

***Indicators***

The following indicators have been developed to assess potential impacts on migratory birds:

- Causing a substantial reduction in a population's numbers, causing a migratory bird population to drop below self-sustaining levels, or causing a substantial loss or disturbance to habitat;
- Violations of the Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act (MBTA), or applicable BLM guidance (e.g., IM 2010-156 or IM 2008-050) or regulations (BLM Manual 6840); or
- Interference with the movement of any migratory bird, or impeding the use of native wildlife nursery sites.

***Region of Influence***

The ROI for direct and indirect effects on migratory birds includes the biological survey area for each project. This includes the defined project footprint of each project facility, as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

## SPPC Project Area

### ***Proposed Action***

#### *Direct Impacts*

In general, direct impacts on migratory birds would be similar to those described in **Section 4.11**, Wildlife. Mortality or injury to birds could occur from construction activities or collisions, especially for ground- and shrub-nesting birds. Take of migratory birds could occur if nesting birds were disturbed.

Bird mortality and/or injury could occur during operation of the SPPC Project due to collision or electrocution with the transmission line. Bird collisions may occur when a transmission line transects a daily flight path used by a concentration of birds or when migrants are traveling at reduced altitudes and encounter tall structures in their path. These collisions generally occur during inclement weather or low light levels, and are more common with waterfowl, shorebirds, and other large species with low maneuverability (APLIC 2006, Faanes 1987). To reduce the risk of bird collisions, construction would conform to those practices described in the document “Mitigating Bird Collisions with Power Lines: The state of the art in 1994” (APLIC 1994).

Electrocution occurs when a perching bird simultaneously contacts two energized phase conductors or an energized conductor and grounded hardware. This can occur when horizontal separation is less than the wrist-to-wrist (flesh-to-flesh) distance of a bird’s wingspan or when vertical separation is less than a bird’s length from head to foot. Raptors are usually more at risk of this type of electrocution because of their size, distribution, and behavior. However, raptor electrocution on the 230-kV transmission lines would be unlikely, due to the larger distance between conductor and shield wires. Furthermore, the project will conform to guidelines that have been developed to reduce avian electrocution risk (APLIC 2006). Substations also may pose electrocution hazards for some birds, since the wires, bus work, and support structures can provide potential roosting, perching, and nesting sites. Birds may be electrocuted when making conductor-to-conductor or conductor-to-ground contact with uninsulated equipment. However, high voltage components of the SPPC substation would provide sufficient conductor clearance to minimize bird electrocutions.

Of particular concern are: 1) the Project’s proximity to existing power lines and trees, which are current barriers to bird movement that resident birds may have adapted to, and 2) the Project’s proximity to the Carson Lake and Pasture, which is used by many bird species (see **Section 3.12**) that could be affected by nearby transmission lines as they fly between water sources. If the SPPC transmission line was sited in areas with existing power lines and trees, such as Macari Lane, and as far away from the Carson Lake and Pasture as feasible, then

impacts on bird movement would be minimized. The proposed project crosses through habitat that is lower quality and human modified (e.g., agricultural areas) compared with native, undisturbed habitats. However, the proposed project follows the Carson Lake and Pasture title transfer boundary for approximately 0.5 mile, siting the transmission line close to migratory bird habitat and posing a flight hazard to birds on the north side of the Carson Lake and Pasture.

Noise and visual disturbance during construction could lead to nest abandonment and chick mortality, as well as physiological effects such as those described previously for wildlife. Nesting raptors may be disturbed as far as 0.5 mile from construction activities. In addition migrating birds that depend on the Carson Lake and Pasture as a stopover location could potentially avoid the area during construction, particularly the wetlands in and near the Project Area, during construction due to noise disturbance and human presence. It is possible that birds would still use suitable habitat to the south and west of the proposed project within the Carson Lake and Pasture, as these areas would be far enough away to avoid noise and human disturbances. There could be increased competition for resources in this area, which may or may not be able to support more birds.

The proposed project would result in 352 acres of permanent habitat loss within the Lahontan Valley Wetlands IBA. This IBA supports foraging, sheltering, and nesting habitat. This represents a direct effect to approximately 0.08 percent of the IBA. As such, the amount of migratory bird habitat affected by the Proposed Action would remain small compared to the amount of comparable habitat present on surrounding lands. Bird habitat could become less suitable if invasive, nonnative species were to be introduced or spread, as a major bird food source is seeds from native grasses and shrubs. Most impacts would occur on agricultural lands, with fewer impacts on the greasewood flat, emergent marsh, playa, and mixed salt desert scrub communities (Tables 4-10 and 4-11). Migratory birds typical of these communities, as described in **Section 3.12, Migratory Birds**, would be affected.

#### *Indirect Impacts*

As described previously for wildlife, the proposed transmission line could provide perching or nesting habitat to corvids or raptors, which could allow them to prey upon other bird species. The agricultural areas provide substantive habitat for a variety of raptors, including excellent foraging grounds. However, perch deterrents would be installed where feasible and appropriate along power line sections near the Carson Lake and Pasture, which is considered high value habitat and supports a large prey base for raptors in the area. Perch deterrents have been demonstrated to minimize raptor and common raven activity on recently constructed transmission lines (Slater and Smith 2010).

*BLM-Designated Sensitive Bird Species-Specific Impacts*

Golden eagle. While no nests occur in the SPPC Project Area, foraging may occur, especially along the proposed transmission line section along the northeast side of the Bunejug Mountains (Figure 2-1). Construction activities associated with installation of the 230-kV transmission line may cause eagles to forage elsewhere in during construction and permanently avoid the immediate corridor area. Electrocution would be avoided by following guidelines to reduce avian electrocution risk (APLIC 2006). In order to comply with the Bald and Golden Eagle Protection Act and BLM's IM 2010-156, an avian protection plan would be developed utilizing these recommendations and in consultation with the USFWS to reduce the risk of "take" for golden eagles and to reduce the likelihood of population-level impacts. The avian protection plan measures would be incorporated into the POD.

Swainson's hawk. During the site survey, Swainson's hawks were plentiful in the area, and an occupied nest was located near the proposed alignment along Macari Lane. The agricultural areas nearby provide ample foraging habitat for this species. The proposed project could disturb nesting Swainson's hawk if construction activities occurred while a nest is occupied. Furthermore, the proposed project could result in take of Swainson's hawk if occupied nesting habitat were removed. It is likely that, while Swainson's hawks may avoid the area due to construction noise, they would recolonize the area in over time. Permanent habitat loss associated with the proposed project would be small relative to the total amount of foraging habitat in the region, and so there would be no likely permanent population-level effects on the species due to habitat loss. The proposed transmission line towers could provide additional perching opportunities, which might be used by Swainson's hawks while foraging.

Other BLM-Designated Sensitive Species. Loggerhead shrike and long-billed curlew have been observed within the SPPC Project Area. Long-billed curlew were observed in a wet meadow adjacent to the proposed alignment where it follows Macari Lane. Furthermore, while not observed during surveys, potential habitat does occur for burrowing owl and short-eared owl, both BLM-designated sensitive. The Project Area provides potential nesting habitat for all of these species. Direct impacts from construction of the proposed project could result in take of these species, if occupied nesting habitat were removed. Furthermore, these species may be temporarily displaced from the Project Area due to construction-related activities, but are likely to recolonize the area over time, reducing the likelihood of population-level effects. Indirect impacts could result from increased predation by corvids and raptors hunting from the transmission line towers. This potential mortality would not be expected to cause any one species to drop below self-sustaining numbers.

*USFWS Birds of Conservation Concern*

Sage sparrow has been observed within the SPPC Project Area, and the Project Area provides potential nesting habitat for this species. Impacts would be similar to those described previously for other BLM-designated Sensitive species.

*Game Birds Below Desired Condition*

Both mourning dove and mallard were observed within the SPPC Project Area, and potential nesting habitat exists. Impacts would be similar to those described for the other BLM-designated sensitive species.

*Mitigation and Monitoring Measures*

Impacts on migratory birds would be reduced through implementation of BMPs. Mitigation measures to reduce migratory bird impacts, where feasible and appropriate, would be detailed in the POD, which would include development of a wildlife protection plan, invasive, nonnative plant species management plan, and revegetation plan. An avian protection plan for golden eagles is under development through coordination with the USFWS. Other measures would be employed, such as installing perch and nest prevention devices and anti-collision devices on all relevant structures, where applicable. A monitoring program, to be detailed in the POD, would be implemented to detect collisions and additional mitigation would be required if necessary. These measures would likely prevent take of migratory bird species, as defined by the MBTA, and would reduce the likelihood of population-level effects.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one migratory bird species inhabiting areas near the transmission corridor. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the SPPC Proposed Action would cause substantial habitat loss, substantial restriction of migratory bird movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because approximately 50 percent of the project facilities would be located in agriculturally disturbed areas, and relatively few acres of native habitat would be lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POD. The POD would be finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts on individuals resulting from construction, operation, and maintenance would include potential bird collisions associated with the presence of new transmission lines. However, with implementation of mitigation measures contained in plans within the POD, no residual impacts leading to substantial population declines for any one species are expected.

### ***Alternative 1***

#### *Direct Impacts*

Direct impacts on migratory birds from Alternative 1 would be similar to those described for the Proposed Action. Alternative 1 would cause an additional 2 acres of temporary and 13 fewer acres of permanent disturbance to habitat that birds may use for feeding, sheltering, or nesting compared with the Proposed Action. Furthermore, Alternative 1 would permanently impact more native habitat, including two and a half times the acreage of emergent marsh and wet meadow habitat (Tables 4-10 and 4-11). Alternative 1 would also be more likely to impact bird movement, e.g., cause bird collisions, as it would follow Macari Lane for a shorter distance (over one mile), and would follow the Carson Lake and Pasture on its north side for a longer distance (approximately three miles). As a result, this Alternative would pose a greater obstacle to bird movement in areas where power lines and trees do not exist. Due to its proximity to Carson Lake and Pasture, noise from construction associated with Alternative 1 would be more likely to disturb birds using that habitat.

#### *Indirect Impacts*

Indirect impacts on migratory birds from Alternative 1 would be similar to those described for the Proposed Action. Due to its proximity to Carson Lake and Pasture, the transmission line may attract more corvids or raptors that would prey upon shorebirds using the Carson Lake and Pasture.

#### *Mitigation and Monitoring Measures*

Mitigation measures for migratory birds under Alternative 1 would be the same as those recommended for the Proposed Action.

#### *Residual Impacts*

Residual impacts on migratory birds from Alternative 1 would be similar to those described for the Proposed Action.

### ***Alternative 2***

#### *Direct Impacts*

Alternative 2 would cause 24 fewer acres of temporary and 23 fewer acres of permanent disturbance to bird habitat compared with the Proposed Action (Tables 4-10 and 4-11). Alternative 2 would be the least likely Alternative to affect bird movement, as it follows Macari Lane for a longer distance than the Proposed Action (approximately three miles), and would as such be sited the farthest from the Carson Lake and Pasture. As a result, this alternative would reduce the amount and likelihood of bird collisions.

#### *Indirect Impacts*

Indirect impacts on migratory birds from Alternative 2 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures for migratory birds under Alternative 2 would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts on migratory birds from Alternative 2 would be similar to those described for the Proposed Action.

**Alternative 3 (Preferred)***Direct Impacts*

Alternative 2 would cause 24 fewer acres of temporary and 23 fewer acres of permanent disturbance to bird habitat compared with the Proposed Action (Tables 4-10 and 4-11). Alternative 2 would be the least likely Alternative to affect bird movement, as it follows Macari Lane for a longer distance than the Proposed Action (approximately three miles), and would as such be sited the farthest from the Carson Lake and Pasture. As a result, this alternative would reduce the amount and likelihood of bird collisions.

*Indirect Impacts*

Indirect impacts on migratory birds from Alternative 2 would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures for migratory birds under Alternative 2 would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts on migratory birds from Alternative 2 would be similar to those described for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

The types of direct impacts on migratory birds from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary (7 acres) and permanent (5 acres) disturbance, direct impacts would be minimal.

*Indirect Impacts*

The types of indirect impacts on migratory birds from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary and permanent disturbance acreage, indirect impacts would be minimal.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures for migratory birds under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts on migratory birds from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on migratory birds would not occur.

**Ormat Project Area*****Proposed Action****Direct Impacts*

Direct impacts on migratory birds from the Ormat Project would be similar to those described previously for the SPPC Project. Impacts from operation of the Ormat transmission line would be fewer, since it would only be 200 feet long. Furthermore, there would be fewer impacts on migratory birds which utilize agricultural areas, since this habitat type would not be affected by the Ormat Project.

The Ormat Proposed Action would have permanent effects on 208 acres of habitat in the Lahontan Valley Wetlands IBA, or approximately 0.05 percent of the IBA. As such, the amount of migratory bird habitat affected by the project actions would remain small compared to the amount of comparable habitat present on surrounding lands. Most impacts would occur in the greasewood flat community, with fewer impacts in the playa and mixed salt desert scrub communities (Table 4-12). Migratory birds typical of these communities, as described in **Section 3.12, Migratory Birds**, would be affected.

*Indirect Impacts*

Indirect impacts on migratory birds would be similar to those described previously for the SPPC Project. Impacts from operation of the Ormat transmission line would be fewer, since it would only be 200 feet long.

*BLM-Designated Sensitive Bird Species*

Golden eagle. Golden eagle is known to occur in the Ormat Project Area, and an active nest is located approximately 1.5 miles from proposed well locations, east of Highway 50. The proposed project would cause the permanent loss of approximately 208 acres of foraging habitat, caused by construction of the power plant, 6.5-mile pipeline, access roads, and 13 possible well pads; however, the Project Area does not provide suitable nesting habitat for golden eagles. Golden eagles would avoid the area during construction activities. Over time, golden eagles would likely return to the restored Project Area for foraging,

reducing the likelihood of population-level effects. The active golden eagle nest located near Highway 50 would not likely be disturbed from construction or operation of the Ormat Project.

Prairie falcon. Prairie falcons use similar foraging and nesting habitat as golden eagles. Prairie falcons were not observed within the Ormat Project Area, but nesting habitat is located within 1 mile, and the Project Area has suitable foraging habitat. Impacts would be similar to those described for golden eagles.

Swainson's hawk. A Swainson's hawk occupied nest was located within the Ormat Project Area along the Newlands canal (L-12 canal) near proposed well site Y. The agricultural areas nearby provide ample foraging habitat. The proposed project could disturb nesting Swainson's hawk if construction activities occurred while a nest is occupied. Furthermore, the proposed project could result in take of Swainson's hawk if occupied nesting habitat were removed. It is likely that, while Swainson's hawks may avoid the area during construction activity, they would return to forage or nest within the area over time. Foraging habitat that would be permanently lost associated with the proposed project would be small relative to the amount of foraging habitat in the region; therefore, permanent population-level effects on the species due to habitat loss are not likely to occur.

Other BLM-Designated Sensitive species. Loggerhead shrike and long-billed curlew have been observed within the Ormat Project Area. A long-billed curlew nest was observed in a wet meadow west of the proposed well site U. Furthermore, while not observed during surveys, potential nesting habitat does occur for snowy plover and short-eared owl. The Project Area provides potential nesting and foraging habitat for all of these species. Construction of the proposed project could result in take of these species, if occupied nesting habitat were removed. Furthermore, these species may avoid the Project Area during construction activity, but are likely to return to the area over time, reducing the likelihood of population-level effects.

#### *USFWS Species of Conservation Concern*

The Ormat Project Area provides potential nesting habitat for Brewer's sparrow and sage sparrow. Neither of these species was observed within the Project Area, but both were observed nearby. Impacts would be similar to those described previously for the BLM-designated sensitive species.

#### *USFWS Game Birds Below Desired Condition*

Both mourning dove and mallard were observed within the Ormat Project Area, and potential nesting habitat exists in the area. Potential habitat is also present for canvasback. Impacts would be similar to those described for the other BLM-designated sensitive species.

*Mitigation and Monitoring Measures*

Mitigation measures for migratory birds would be the same as those described previously for SPPC Project.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one migratory bird species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Ormat Project would cause substantial habitat loss, substantial restriction of migratory bird movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POU. The POU would be finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts would be similar to those described for the SPPC Project. The Ormat Project could have fewer bird collisions, because the transmission line would be shorter. With implementation of mitigation measures contained in plans within the POU, no residual impacts leading to substantial population declines for any one species are expected.

***Alternative I (Preferred)****Direct Impacts*

Direct impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause three fewer acres of temporary and two fewer acres of permanent disturbance to bird habitat compared with the Proposed Action (Table 4-12). In addition, two of the well sites and the associated portion of the pipeline would not be located within wet meadow habitat and would be farther from the Carson Lake and Pasture, thus reducing loss of wet meadow habitat and noise disturbance to birds using that area.

*Indirect Impacts*

Indirect impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for migratory birds under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on migratory birds would not occur.

**Vulcan Project Area*****Proposed Action (Preferred)****Direct Impacts*

Direct impacts on migratory birds from the Vulcan Project would be similar to those described for the SPPC Project. The likelihood for direct impacts would be greater for the Vulcan project due to the larger acreage that would be affected and the larger number of migratory birds that were observed within the Vulcan Project Area. In particular, the playa and seasonal wetland habitat within Eightmile Flat, which provides habitat for shorebirds, would be affected (Table 4-13). The proposed project would have permanent effects on approximately 760 acres of habitat in the Lahontan Valley Wetlands IBA, or approximately 0.17 percent of the IBA.

Most impacts would occur in the mixed salt desert scrub community, with fewer impacts in the playa and greasewood flat communities (Table 4-13). Migratory birds typical of these communities, as described in **Section 3.12, Migratory Birds**, would be affected.

*Indirect Impacts*

Indirect impacts on migratory birds would be similar to those described for the SPPC Project.

*BLM-Designated Sensitive Bird Species*

Golden eagle. Golden eagle is known to occur in the Vulcan Project Area, and two unoccupied but relatively active nest locations are within 0.5 mile of Vulcan's proposed wells and transmission line. One nest site has several alternate nests located on a rock outcrop adjacent to Vulcan's proposed transmission line near well pad 30. This nest is located near a private gravel quarry, which likely produces some noise disturbance during intermittent daily operations. A second nest is located near well pad 45 and Power Plant Site 5 and has been more recently used by prairie falcons and may have not been used by golden eagles for a number of years.

Golden eagles are generally considered sensitive to a variety of disturbances, even when these disturbances occur as far as one mile from nest locations. Golden eagles have been documented abandoning nests due to disturbances such as repeated approaches (e.g., recreational activities) adjacent to nest sites

during the incubation period. Other disturbances to golden eagles may result in stressed adults spending considerable time away from a nest, resulting in reduced fitness of offspring due to lower food availability, or chick mortality or egg loss due to exposure, predation, or desiccation. Golden eagles only produce one clutch per year and generally never attempt re-nesting after a failed nest. Repeated nest failures can result in nest or territory abandonment (Kochert et al. 2002). Golden eagle nest success also depends on presence of an ample prey base, primarily jackrabbits.

Activities associated with construction of the proposed project, such as human presence, drilling of wells, and construction of pipelines, power plants, and the transmission line, could temporarily displace foraging birds, or could disturb nesting birds, especially nests within one mile of project facilities.

In addition, the proposed project would cause the permanent loss of approximately 760 acres of foraging habitat, caused by the 4 possible power plants, 26 possible well pads, access roads, 19-mile pipeline, and 8-mile transmission line, but the amount of foraging habitat lost would be minimal given the available foraging habitat of Carson Lake and Pasture as well as the surrounding mixed salt desert scrub habitat. Over time, golden eagles may use portions of the Project Area for foraging, especially if the area is recolonized by its prey species.

Permanent noise associated with power plant operation would not likely be a measurable impact, as the low frequency noise would likely attenuate a short distance from the power plant. Likewise, as stated in **Section 4.12, Migratory Birds**, electrocution from power lines would not likely be a measurable impact. The general increase in human activity associated with the maintenance of pipelines and wells could cause intermittent disruption to nesting birds, and in the most extreme case, could cause nest abandonment.

The proposed Vulcan transmission line is one quarter of a mile from the nesting outcrop and bisects the golden eagle nesting and foraging habitat. The transmission line would create a minor distraction for golden eagles foraging between habitats, although the birds would likely forage farther from the nest than they may have in the past, as they would likely fly over, rather than under, the transmission lines. The transmission towers would provide perch sites for this species, potentially enhancing hunting success. However, the transmission lines may have greater impacts on fledgling golden eagles (Collopy 2010). As a result, the transmission line could cause an increase in collisions with individual birds, particularly newly fledged golden eagles that are not yet strong flyers and would have trouble navigating around the lines.

Prairie falcon. Prairie falcons use similar foraging and nesting habitat as golden eagles. Prairie falcons were not observed within the Vulcan Project Area, but potential nesting and foraging habitat occurs. Impacts would be similar to those described for golden eagles.

Swainson's hawk. Swainson's hawks were observed within the Vulcan Project Area, and were observed nesting nearby. No potential nesting habitat for Swainson's hawks occurs within the Vulcan Project Area. It is likely that, while Swainson's hawks may avoid the area due to construction activities, they would eventually return to foraging habitat in the area. Permanent habitat loss associated with the proposed project would be small relative to the amount of foraging habitat in the region, and so there would be no likely permanent population-level effects on the species due to habitat loss.

Other BLM-Designated Sensitive species. Loggerhead shrike has been observed within the Vulcan Project Area. Furthermore, while not observed during surveys, potential habitat does occur for burrowing owl, long-billed curlew, and snowy plover. The Project Area provides potential nesting habitat for all of these species except long-billed curlew. Construction of the proposed project could result in take of these species, if occupied nesting habitat were removed. Furthermore, these species may avoid the Project Area during construction due to noise, but are likely to return to the area over time, reducing the likelihood of population-level effects. Permanent removal of playa and seasonal wetland habitat would affect those species that forage in these areas, particularly long-billed curlew and snowy plover.

#### *USFWS Species of Conservation Concern*

Brewer's sparrow and sage sparrow were observed within the Vulcan Project Area. Impacts would be similar to those described previously for the BLM-designated sensitive species.

#### *Game Birds Below Desired Condition*

Both mourning dove and mallard were observed within the Vulcan Project Area, and potential nesting habitat exists. Impacts would be similar to those described for the other BLM-designated sensitive species.

#### *Mitigation and Monitoring Measures*

Mitigation measures for migratory birds would be the same as those described previously for the SPPC Project.

#### *Impact Summary*

Available information is inadequate to predict the extent of impacts on any one migratory bird species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Vulcan Proposed Action would cause substantial habitat loss, substantial restriction of migratory bird movement, or substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POU. The POU would be

finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts would be similar to those described for the Ormat Project.

**Alternative I**

*Direct Impacts*

Direct impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 173 acres of temporary and 76 acres of permanent disturbance to bird habitat compared with the Proposed Action (Table 4-13). Disturbance would be associated with the construction of the Bass Flat Switching Station and the associated 4-mile transmission line extension to this switching station.

*Indirect Impacts*

Indirect impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for migratory birds under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts on migratory birds from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts on migratory birds would not occur.

## **4.13 BLM-DESIGNATED SENSITIVE SPECIES (ANIMALS AND PLANTS)**

### **Summary**

**Assessment Methodology**

Assessment of BLM-designated sensitive animal and plant species and potential habitat was based on surveys conducted of the Salt Wells Energy Projects Area between May and July 2010 (Figures 3-18 through 3-20) and on the SWReGAP data, NNHP data, correspondence with the USFWS, and NDOW comment letters and communication. BLM-designated sensitive bird species are discussed previously in **Section 4.12, Migratory Birds**.

**Indicators**

For BLM-designated sensitive plants, indicators focus on the acreage of disturbance of species habitat, as well as the potential for direct impacts on BLM-designated sensitive species.

Potential impacts on BLM-designated sensitive animal species could occur if reasonably foreseeable future actions were to result in the following:

- Effects on any individual or population of BLM-designated sensitive species, such that the project would contribute to the need to list any of them; or
- Substantial effects on the quality or quantity of habitat available for a BLM-designated sensitive species over time.

### ***Region of Influence***

The ROI for direct and indirect effects on BLM-designated sensitive species includes the biological survey area for each project. This includes the defined project footprint of each project facility, as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

## **SPPC Project Area**

### ***Proposed Action***

#### *Direct Impacts*

Direct impacts on BLM-designated sensitive species would be similar to those described in **Section 4.11**, Wildlife, and **Section 4.12**, Migratory Birds. Birds are the only BLM-designated sensitive species that could be impacted within the SPPC Project Area.

#### *Indirect Impacts*

Indirect impacts on BLM-designated sensitive bird species would be similar to those described previously in **Section 4.11**, Wildlife, and **Section 4.12**, Migratory Birds.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as those described in **Section 4.11**, Wildlife, and **Section 4.12**, Migratory Birds. With implementation of mitigation measures, the SPPC Project would not result in take of BLM-designated sensitive bird species' nests and would thus not be in conflict with direction provided in BLM IMs and regulations. Furthermore, the project would not contribute to the need to list any BLM-designated sensitive species.

#### *Impact Summary*

Overall impacts from the SPPC Project would be similar to those described previously in **Section 4.12**, Migratory Birds.

#### *Residual Impacts*

Residual impacts would be similar to those described in **Section 4.12**, Migratory Birds.

### **Alternative 1**

#### *Direct Impacts*

Direct impacts from Alternative 1 would be similar to those described for Alternative 1 in **Section 4.12**, Migratory Birds.

#### *Indirect Impacts*

Indirect impacts from Alternative 1 would be similar to those described for Alternative 1 in **Section 4.12**, Migratory Birds.

#### *Mitigation and Monitoring Measures*

Mitigation measures under Alternative 1 would be the same as those recommended for Alternative 1 in **Section 4.12**, Migratory Birds.

#### *Residual Impacts*

Residual impacts from Alternative 1 would be similar to those described for Alternative 1 in **Section 4.12**, Migratory Birds.

### **Alternative 2**

#### *Direct Impacts*

Direct impacts from Alternative 2 would be similar to those described for Alternative 2 in **Section 4.12**, Migratory Birds.

#### *Indirect Impacts*

Indirect impacts from Alternative 2 would be similar to those described for Alternative 2 in **Section 4.12**, Migratory Birds.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures under Alternative 2 would be similar to those described for Alternative 2 in **Section 4.12**, Migratory Birds.

#### *Residual Impacts*

Residual impacts from Alternative 2 would be similar to those described for Alternative 2 in **Section 4.12**, Migratory Birds.

### **Alternative 3 (Preferred)**

#### *Direct Impacts*

Direct impacts from Alternative 3 would be similar to those described for Alternative 3 in **Section 4.12**, Migratory Birds.

#### *Indirect Impacts*

Indirect impacts from Alternative 3 would be similar to those described for Alternative 3 in **Section 4.12**, Migratory Birds.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures under Alternative 3 would be similar to those described for Alternative 3 in **Section 4.12**, Migratory Birds.

*Residual Impacts*

Residual impacts from Alternative 3 would be similar to those described for Alternative 3 in **Section 4.12**, Migratory Birds.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary (7 acres) and permanent (5 acres) disturbance (Tables 4-10 and 4-11), direct impacts would be minimal.

*Indirect Impacts*

Indirect impacts from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action. However, due to the limited temporary and permanent disturbance acreage, indirect impacts would be minimal.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures under the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

*Residual Impacts*

Residual impacts from the Macari Fiber Optic Alternative would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts would not occur.

**Ormat Project Area****Proposed Action***Direct Impacts*

Direct impacts caused by the Ormat Project would be similar to those described for the SPPC Project.

*Indirect Impacts*

Indirect impacts would be similar to those described previously for the SPPC Project. Collisions and electrocutions with the transmission line would be less of a concern with the Ormat Project, as the transmission line is only 200 feet long compared to 22 miles long for the SPPC Project.

*BLM-Designated Sensitive Species-Specific Impacts*

BLM-Designated Sensitive Bat Species. There is no roosting habitat within the Ormat Project Area, and use of the habitat in the Project Area by bat species is likely limited to foraging. Loss of foraging habitat would be extremely limited and no population-level effects are anticipated during construction or operation of the proposed project.

Pallid Wood Nymph. Potential habitat exists within the Ormat Project Area for pallid wood nymph, which inhabits alkali meadows. The species was not observed during surveys. Since little is known about the ecology of this species, assessment of impacts is difficult. The proposed project could remove habitat for this species, including host or nectar plants. The species may be very sensitive to noise or human disturbance, and individuals may avoid the area during construction or permanently. In the worst case scenario, the species would be displaced from suitable habitat within the Project Area permanently, but similar habitat adjacent to the Project Area exists within the Carson Lake and Pasture, reducing the likelihood of population-level effects.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as those described in **Section 4.11**, Wildlife, and **Section 4.12**, Migratory Birds.

A pre-construction survey for pallid wood nymph is recommended within the Project Area during the general flight time for butterfly species. If the pallid wood nymph is observed, measures would be implemented to avoid impacts on any populations. Measures could include the installation of fencing around host plants to protect against vehicle and human impacts, or redesigning project features.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one BLM-designated sensitive species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Ormat Project would cause substantial habitat loss, substantial restriction of wildlife movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative species, and revegetation plans that would be detailed in the POU. The POU would be finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts would be similar to those described in **Section 4.12**, Migratory Birds. In addition, some BLM-designated sensitive bats would

permanently avoid foraging in the area due to increased development, human presence, and background noise. However, with implementation of mitigation measures contained in plans within the POD, no residual impacts leading to substantial population declines for any one species are expected.

***Alternative I (Preferred)***

*Direct Impacts*

Alternative I proposes to locate wells U and V farther away from wetland vegetation adjacent to the canal and the wildlife that this habitat type supports. Therefore, this alternative may have diminished overall effects from construction activities such as noise and human presence when compared to the Proposed Action. Alternative I would have three fewer acres of temporary and two fewer acres of permanent disturbance to habitat compared with the Proposed Action. Other impacts would be the same as the Proposed Action.

*Indirect Impacts*

Indirect impacts from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative I would be the same as those recommended for the Proposed Action.

*Residual Impacts*

Residual impacts from Alternative I would be similar to those described for the Proposed Action.

***No Action Alternative***

Under the No Action Alternative, impacts on BLM-designated sensitive species would not occur.

**Vulcan Project Area**

***Proposed Action (Preferred)***

*Direct Impacts*

Direct impacts from the Vulcan Project would be similar to those described for the SPPC Project.

*Indirect Impacts*

Indirect impacts would be similar to those described previously for the SPPC Project.

*BLM-Designated Sensitive Species-Specific Impacts*

BLM-Designated Sensitive Bat Species. The Project Area provides roosting and foraging habitat for special status bat species. Bats use rock outcrops in the Project Area for roosting, and likely forage in the vegetated areas. A pallid bat roost was located near proposed Power Plant Site 3. Loss of foraging habitat would be a direct effect, although a very small proportion of the total foraging habitat in the region would be removed by the proposed project. Construction noise and human presence could cause bats to temporarily abandon their roosts, especially those that are near proposed project facilities. During operation of the project, bats would not be likely to roost in equipment and structures on site due to noise and human presence. It is possible that bats may permanently avoid roosting or foraging habitat near proposed project facilities. However, permanent habitat loss associated with the proposed project would be small relative to the total amount of foraging and roosting habitat in the region, and so there would be no likely permanent population-level effects on the species due to habitat loss.

Pallid Wood Nymph. Potential habitat exists within the Ormat Project Area for pallid wood nymph, which inhabits alkali meadows. The species was not observed during surveys. Since little is known about the ecology of this species, assessment of impacts is difficult. The proposed project could remove habitat for this species, including host or nectar plants. The species may be very sensitive to noise or human disturbance and may avoid the area during construction or permanently. In the worst case scenario, the species would be permanently displaced from suitable habitat within the Project Area, but similar habitat adjacent to the Project Area exists within Carson Lake and Pasture, reducing the likelihood of population-level effects.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as those described in **Section 4.12**, Migratory Birds, and **Section 4.11**, Wildlife.

*Impact Summary*

Available information is inadequate to predict the extent of impacts on any one BLM-designated sensitive species inhabiting areas near the proposed facilities. Nevertheless, it is unlikely that impacts from the construction, operation, and maintenance of the Vulcan Project would cause substantial habitat loss, substantial restriction of wildlife movement, or a substantial increase in predation leading to the reduction in abundance of any one species such that the population would drop below self-sustaining numbers. This is because, in comparison to the availability of surrounding suitable habitat, relatively few acres of native habitat would be permanently lost. Furthermore, mitigation measures would be detailed in the wildlife, invasive, nonnative plant species, and revegetation plans that would be detailed in the POU. The POU would be

finalized before issuing the condition of approval to proceed with the final project.

*Residual Impacts*

Residual impacts would be similar to those described for the Ormat Project.

**Alternative I**

*Direct Impacts*

Direct impacts from Alternative I would be similar to those described for the Proposed Action. Alternative I would cause an additional 173 acres of temporary and 76 acres of permanent disturbance to wildlife habitat compared to the Proposed Action (Table 4-13). Disturbance from Alternative I would be associated with the construction of the Bass Flat Switching Station and the associated 4-mile transmission line extension to this switching station. In addition, the transmission line extension provides potential habitat for two BLM-designated sensitive plant species, oryctes and Nevada dune beardtongue. Construction of this Alternative could cause the removal of these plant populations if they occur.

*Indirect Impacts*

Indirect impacts from Alternative I would be similar to those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures under Alternative I would be similar to those recommended for the Proposed Action. In addition, a mitigation measure is recommended to reduce the likelihood for impacts on BLM-designated sensitive plant species.

To prevent impacts on BLM-designated sensitive plant species, a preconstruction survey is recommended. If present, measures would be implemented to avoid impacts on any populations. Measures could include the installation of fencing to protect against vehicle and human impacts, or redesigning project features.

*Residual Impacts*

Residual impacts from Alternative I would be similar to those described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, impacts would not occur.

## 4.14 CULTURAL RESOURCES

### Summary

#### ***Assessment Methodology***

The analysis of potential impacts on cultural resources is based on a Class I records search of nearly 80,000 acres in and buffering the Salt Wells Energy Projects, on the pedestrian Class III cultural resources archaeological inventory and National Register evaluation of nearly 6,200 acres within the archaeological APE, and on the historical architecture inventory and recordation of just over 115 Churchill County APNs within the one-half-mile architectural APE. Determination of National Register eligibility is critical to this assessment and can only be provided by the federal lead agency, the BLM Carson District Office, and Reclamation as a cooperating agency with concurrence from the Nevada SHPO. If a cultural resource (site, building, or district) is eligible to the NRHP, then it is a historic property warranting protection, avoidance, or mitigation. If a cultural resource is unevaluated for the NRHP, it would be managed as if eligible until a determination can be made. If a cultural resource is ineligible for the NRHP, it would still be avoided if possible, but no further mitigation is warranted.

There are historic properties within the Salt Wells Energy Projects cultural resources APEs and these include buildings, districts, trails, prehistoric, historic-era, and ethnohistoric cultural resources.

#### ***Indicators***

Indicators developed to assess potential impacts on cultural resources include the following:

- Project components would be located on, over, or near historic properties including prehistoric, historic, and ethnohistoric archaeological sites; trails and roads; districts; buildings including ranches, dairies, farmsteads, and residences; and areas of traditional Native American concern.
- Project components could result in direct physical impacts such as those caused by land disturbances from all project construction activities, including well pad construction, road building, grading, pipelines, and transmission line construction.
- Project components could result in indirect impacts on historic properties through visual effects on standing structures, historic districts, trails and roads.
- Project components would have an adverse effect on historic properties, their settings, or their integrity under Section 106 of the NHPA (36 CFR 800).

***Region of Influence***

The ROI for cultural resources includes the Salt Wells Energy Projects Area plus a one-mile buffer. The architectural cultural resources ROI is a one-half-mile buffer about the proposed SPPC Project transmission line corridors.

**SPPC Project Area*****Proposed Action******Direct Impacts***

Archaeological and architectural history Class III inventories and NRHP evaluations are ongoing. Preliminary findings indicate historic properties from previous investigations and from the ongoing work may be adversely impacted during any ground disturbing construction activity in the SPPC Project Area. SPPC's use of historic property avoidance and development of treatment plans as specified in the project's *Programmatic Agreement between the BLM, Reclamation, the SHPO and SPPC, Ormat, and Vulcan* for unavoidable significant cultural resources would assure mitigation or avoidance occur on all historic properties receiving potential adverse ground disturbing effects (See **Appendix D**, Programmatic Agreement for the Salt Wells Energy Projects.) Impacts on cultural resources often overlap with impacts on Native American religious concern, visual resources, and national historic trails as discussed in **Sections 4.7, 4.15, 4.17, and 4.21**.

***Indirect Impacts***

The Proposed Actions would change the visual landscape and setting important to integrity of certain historic properties such as unique structures or buildings, ranches, dairies, and farmsteads; historic roads and trails; prehistoric rock art and sacred sites; and historic districts such as the Newlands Project National Register District. Construction and increased access to prehistoric and ethnohistoric sites could result in illicit artifact collecting, an ongoing issue in the BLM and Reclamation managed parts of the Salt Wells Energy Projects. These changes could indirectly affect the integrity of ethnohistoric, sacred, historic, and prehistoric sites, buildings, trails, roads, and districts.

***Mitigation and Monitoring Measures***

Mitigation and monitoring strategies are detailed in the Programmatic Agreement between the BLM, Reclamation, and SHPO and SPPC, Ormat, and Vulcan (See **Appendix D**). If the Proposed Actions are approved, the Programmatic Agreement would guide all activities concerning cultural resources and historic properties within the Proposed Action from its origin date, October 5, 2010, until the undertaking is completed or until it is terminated by one or more of the signatories. The document includes sections on:

- I) Roles and Responsibilities including agreement on the BLM as Lead Federal Agency, and the role of SPPC, Ormat, and Vulcan in

covering costs for identification, evaluation, determination of effect, mitigation and monitoring, and responsibility in protecting cultural resources during construction and operation from unauthorized, inadvertent, or negligent actions by any project personnel.

- 2) Definition of the APE to include all areas containing cultural resources directly, indirectly, and visually impacted by the Proposed Action.
- 3) The BLM would ensure that all Historic Properties in the APE are identified, evaluated for the NRHP, assessed for effects from the Proposed Action, and avoided through project redesign, or treated through development of Treatment or Data Recovery Plans. Field treatment must be complete on archaeological resources eligible under Criterion D prior to construction.
- 4) Provisions are detailed for roles and responsibilities during unanticipated discovery situations where subsurface archaeological remains are encountered during construction or operation.
- 5) Other considerations include roles of cultural resource contractors in training all construction and archaeological personnel to comply with the Archaeological Resources Protection Act of 1979 (16 USC 470) on federal lands and NRS 381 on private lands, and when dealing with human remains NAGPRA (43 CFR 10) on federal and NRS 383 on private lands.
- 6) Monitoring of sensitive areas during project construction by a professional archaeologist, and if requested, a tribal representative, both empowered to stop work to protect cultural resources.
- 7) Notices to Proceed would be issued by the BLM for segments as defined by SPPC, Ormat, and Vulcan in the POD or POU if BLM and SHPO have determined no cultural resources are in the APE; if BLM and SHPO have determined there are no Historic Properties in the APE for a certain segment or location; if the BLM and SHPO have implemented an adequate Treatment Plan for the construction segment or location and fieldwork phase is complete and summarized and approved by BLM, SHPO, and Reclamation; and SPPC, Ormat, and Vulcan have posted a surety bond to cover costs of reporting, analyzing, and curating treated site data or preparing public interpretation projects.
- 8) Execution and implementation of the project Programmatic Agreement would fulfill the signatories responsibilities for Section 106 for all actions associated with the construction and operation of the Salt Wells Energy Projects.

Recommended treatment measures for architectural historic properties are also outlined in treatment plans that help mitigate adverse effects on resources

eligible to the NRHP under criteria A, B, and C. These types of treatment measures might include the following:

- Measures would be taken to minimize the visual impact associated with the proposed action. This may take the form of modifying tower placement, selecting paint colors that diminish the visual impact of the towers, the planting of trees that would eventually reduce the visual impact of the towers, and/or other measures that may be identified in the future.
- Photo-documentation would be prepared of pre-disturbance viewsheds from all NRHP-eligible properties within one-half mile of the power line selected for construction. Emphasis would be placed on documenting viewsheds as seen from the resource looking toward the power line. Also, a representative sample of eligible resources from each property type located within one-half mile of the power line selected for construction would be selected for similar photo-documentation of viewsheds. The documentation would be included in a technical report submitted to the BLM and SHPO.
- Visual/video products intended to document a select number of architectural resources would be prepared. The products would incorporate architectural, historical, and family histories in an integrated manner. Draft products would be submitted to the BLM and SHPO for technical review prior to production. Copies of the final products would be provided to BLM and SHPO for distribution.
- To the extent that access can be secured, a selected sample of specific property types based on standards established by the SHPO for properties of local and state significance would be documented. The documentation would be included in a technical report submitted to the BLM and SHPO.
- Two or more professional articles intended for publication in local or state journals would be prepared. The articles would focus on specific property types, historic periods, and/or centennial ranches. The draft articles would be submitted to the BLM and SHPO for technical review prior to publication. Its content would rely heavily on information developed by the other treatment measures.

It should be noted that the exact type and extent of treatment would be determined based on consultation between the BLM and the SHPO.

#### *Residual Impacts*

Avoidance or mitigation of historic properties would eliminate or reduce most residual impacts from the Proposed Action. Visual changes in the viewshed

surrounding architectural and Newlands Project resources along the proposed transmission line would be permanent and cannot be avoided.

***Alternative 1***

*Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the Proposed Action.

***Alternative 2***

*Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the Proposed Action.

***Alternative 3 (Preferred)***

*Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no adverse impacts on historic properties since the transmission line and its associated facilities would not be constructed.

**Ormat Project Area****Proposed Action***Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action, although visual impacts on buildings are a minor issue with only one architectural historic property in the Ormat Project Area.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the SPPC Proposed Action.

**Alternative I (Preferred)***Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under the SPPC Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no adverse impacts on historic properties since the geothermal power plants and their associated facilities would not be constructed. Construction and operation-related impacts would be avoided.

**Vulcan Project Area**

***Proposed Action (Preferred)***

*Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action, although visual impacts on buildings are absent since no historical architecture resources are present in the Vulcan Project Area.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action minus those related to architectural resources.

*Residual Impacts*

Residual impacts would be the same as identified under the SPPC Proposed Action.

***Alternative I***

*Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action and including potential visual impacts on the Pony Express Trail.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action without those related to architectural resources.

*Residual Impacts*

Residual impacts would be the same as identified under the SPPC Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no adverse impacts on historic properties since the geothermal power plants and their associated facilities including new transmission lines would not be constructed. Construction and operation-related impacts would be avoided.

**4.15 NATIVE AMERICAN RELIGIOUS CONCERNS****Summary*****Assessment Methodology***

The analysis of potential impacts on Native American Concerns is based on a review of known tribal interests, traditional cultural places, trust assets/treaty rights resources, and consultation with the potentially affected Tribes (see **Section 3.15**).

- There are potential places of cultural and/or geographic interest to the Tribes within or near the Salt Wells Energy Projects Area.
- Impacts to prehistoric cultural resource sites are disclosed in **Section 4.14**, Cultural Resources.

***Indicators***

Indicators developed to assess potential impacts on tribal interests or traditional cultural resources include the following:

- Conflict with land uses, management, and economic well-being of adjacent or nearby reservations, trust lands, restricted Indian allotments, and federally tribal-dependent Indian communities;
- Conflict with the exercise of off-reservation treaty and reserved rights, including grazing rights, hunting and fishing rights, gathering rights and interests, and water rights;
- Conflict with federal trust responsibilities to tribes and individual Indians regarding real property, physical assets, or intangible property rights;

- Conflict with existing court decisions, laws, policies, executive orders, and agency agreements with tribes regarding land and resource use;
- Proposed uses that are incompatible with maintaining and identifying cultural resources and their qualities;
- Adverse effect on historic properties or their settings, especially traditional cultural properties and cultural landscapes under Section 106 of the NHPA (36 CFR 800);
- Restricted access to traditionally used hunting, fishing, and gathering areas and species;
- Changed or reduced access to traditionally used or culturally important water sources and hot springs;
- Effects on culturally important trails or trail systems; or
- Effects on sacred sites or their settings, access, or use.

***Region of Influence***

The ROI for Native American religious concerns is the Salt Wells Energy Projects Area and surrounding lands designated as traditionally important to the local Native American culture.

**SPPC Project Area*****Proposed Action******Direct Impacts***

The Native American consultation process remains ongoing at this time. During consultation for the proposed projects, the following concerns were identified: cultural resources including historic properties; continued access and use of the traditional use sites; and other resources that may be affected by the current project.

Access to or the use of traditional use sites may be temporarily impacted during the construction phase of the project. No direct permanent impacts on access to or the use of traditional use sites within the SPPC Project Area have been identified. Impacts on areas of Native American religious concern often overlap with impacts on, water quantity and quality, cultural resources, visual resources and national and historic trails. Further discussion of impacts on water quality and quantity, cultural resources, visual resources, and national and historic trails are discussed in **Sections 4.7, 4.14, 4.17, and 4.21** respectively.

***Indirect Impacts***

The Proposed Actions would change vegetation patterns and wildlife distribution within the temporarily and permanently disturbed areas. Such

changes could indirectly affect the integrity of ethnohistoric, sacred, and ceremonial sites as well as disrupt the flow of *Spirit Power*.

*Mitigation and Monitoring Measures*

In order to maintain access to and use of traditional use sites, the proponents would coordinate with local tribes and plan construction activities around traditional use periods during the construction phase of the project to eliminate any impacts.

Ongoing consultation may result in identification of Native American Religious Concerns which would be reviewed, and, as appropriate and necessary, additional monitoring and mitigation measures would be developed.

*Residual Impacts*

There would be no residual effects on Native American Religious Concerns resulting from implementation of the Proposed Action. The ongoing consultation process may result in identification of Native American Religious Concerns regarding residual effects of the proposed Project, which would be reviewed and considered during preparation of the ROD.

**Alternative 1**

*Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the Proposed Action.

**Alternative 2**

*Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the Proposed Action.

**Alternative 3 (Preferred)***Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts would be the same as identified under the Proposed Action.

*Indirect Impacts*

The Macari Fiber Optic Alternative would involve construction of a fiber optic line and tie-in at Highway 50, less than 1 mile from the Grimes Point Archaeological Site. The visual integrity of the site could be impacted during construction of the line. Impacts are further discussed in the cultural resources and visual resources sections of this chapter.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, the BLM would continue to manage Native American Religious Concerns on its properties, in compliance with federal laws and regulations. Because the transmission line and its associated facilities would not be constructed, construction-related impacts would be avoided.

**Ormat Project Area*****Proposed Action****Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the SPPC Proposed Action.

***Alternative 1 (Preferred)****Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual Impacts would be the same as identified under the SPPC Proposed Action.

***No Action Alternative***

Under the No Action Alternative, the BLM would continue to manage Native American Religious Concerns on its properties, in compliance with federal laws and regulations. Because the proposed geothermal power plants and their associated facilities would not be constructed, construction and operation-related impacts would be avoided.

## **Vulcan Project Area**

### ***Proposed Action (Preferred)***

#### *Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

#### *Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

#### *Residual Impacts*

Residual Impacts would be the same as identified under the SPPC Proposed Action.

### ***Alternative I***

#### *Direct Impacts*

Direct impacts would be the same as identified under the SPPC Proposed Action.

#### *Indirect Impacts*

Indirect impacts would be the same as identified under the SPPC Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be the same as identified under the SPPC Proposed Action.

#### *Residual Impacts*

Residual Impacts would be the same as identified under the SPPC Proposed Action.

### ***No Action Alternative***

Under the No Action Alternative, the BLM would continue to manage Native American Religious Concerns on its properties, in compliance with federal laws and regulations. Because the proposed geothermal power plants and their associated facilities would not be constructed, construction and operation-related impacts would be avoided.

## 4.16 PALEONTOLOGICAL RESOURCES

### Summary

#### **Assessment Methodology**

Specific paleontological features may have value to scenic, recreational, or cultural resources, and impacts on these resources are discussed in their respective sections. In this section, impacts on paleontological features are evaluated only from the perspective of scientific value (see **Section 3.16**, Paleontological Resources). Effects are quantified where possible; in the absence of quantitative data, best professional judgment was used.

#### **Indicators**

The following indicators were developed to evaluate potential impacts of the Salt Wells Energy Projects on paleontological resources:

- Project components would be located on or near paleontological localities. The primary indicators for paleontological localities include the type of parent material (e.g., bedrock), and the number, type, and significance of recorded localities within the Salt Wells Energy Projects Area disturbance footprint.
- Proposed Actions or Alternatives could result in substantial erosion of paleontological localities. The primary indicators for erosion of paleontological localities include landslides, vibration, dust, water vapor and condensation, and subsidence.

### SPPC Project Area

#### **Proposed Action**

As discussed in **Section 3.15**, Paleontological Resources, it is unlikely that the Proposed Action would affect geologic units that have the potential to contain paleontological resources. Though many of the activities involved with the Proposed Action would result in some degree of ground disturbance, the presence of Quaternary alluvium and playa deposits and Tertiary volcanic deposits have low potential to contain paleontological resources.

#### **Direct Impacts**

If paleontological resources are present within the SPPC Project Area, impacts on those resources are more likely to occur where ground disturbance takes place and the work site has not experienced substantial prior disturbance. The greatest concern would be new construction activities, which are likely to occur on previously undisturbed or largely undisturbed parcels. Substantial damage to or destruction of paleontological resources, as defined by BLM, would represent an impact to those resources. In most cases, new minor construction would require preparation of a site-specific paleontological investigation.

*Indirect Impacts*

No indirect impacts on paleontological resources are expected to result from the continuing operation of the Proposed Action.

*Mitigation and Monitoring Measures*

Pleistocene and early Holocene surficial deposits, such as alluvium, colluvium, talus, and playa deposits, have a low paleontological sensitivity ranking. Monitoring during construction would not be required, but spot-checking may be conducted in certain areas at the discretion of the BLM Staff Paleontologist. In the case of the Quaternary deposits, this would ensure that any older underlying fossiliferous sediments were not being affected.

If paleontological localities are identified in the SPPC Project Area, the following mitigation and monitoring measures would be implemented:

1. Include site-specific evaluation of paleontological sensitivity for construction or maintenance activities requiring ground disturbance. For any construction or maintenance activity that requires ground disturbance, SPPC would ensure that preconstruction studies include assessment of the site's paleontological sensitivity by a state-registered professional geologist (PG) or qualified professional paleontologist. If the paleontological assessment determines that any of the substrate units that would be affected by the planned activity are highly sensitive for paleontological resources, the report would also include recommendations for appropriate and feasible procedures to avoid or minimize damage to any resources present, prepared by a qualified professional paleontologist. SPPC would be responsible for ensuring implementation of the measures identified.

The potential for impacts on paleontological resources as a result of construction or maintenance activities is lower because ground disturbance associated with these activities is typically confined to existing ROWs and immediately adjacent areas, which have already undergone some level of disturbance associated with installation and maintenance of existing infrastructure. To ensure that further ground disturbance does not result in additional damage to paleontological resources, SPPC would also implement the following measure for all activities except emergency repairs; note that this measure would also ensure against impacts as a result of any new minor construction not subject to site-specific geotechnical investigation.

2. Stop work if substantial fossil remains are encountered during construction. If substantial fossil remains (particularly vertebrate remains) are discovered during construction or maintenance activities, work on the site would stop immediately until a state-registered PG or qualified professional paleontologist can assess the

nature and importance of the find, and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may also include preparation of a report for publication describing the finds. SPPC or BLM would be responsible for ensuring that recommendations regarding treatment and reporting are implemented.

If emergency repairs are needed, Vulcan would conduct repairs as rapidly as possible to ensure continuity of service and to protect public safety. As a result, it is typically infeasible to implement a stop work order, such as that required under Mitigation Measure 2, during emergency repairs. By their nature, emergency repairs affect existing infrastructure and thus would take place in ROWs and immediately adjacent areas that have already undergone some level of disturbance associated with installation and maintenance of existing utilities infrastructure. Consequently, the potential for impacts as a result of emergency repairs is considered low, but some potential nonetheless remains. Implementation of the following measure would reduce impacts on the extent feasible.

3. Implement follow-up assessment and remediation in the event paleontological resources are discovered during emergency repairs. If paleontological resources are discovered during emergency repairs, SPPC would ensure that they are evaluated by a state-registered PG or qualified professional paleontologist as soon as practicable following the completion of all necessary and required repair work. If appropriate, a qualified professional paleontologist would develop a remedial treatment plan consistent with the prevailing standard of care for paleontological resources. The treatment plan may provide for any or all of the following: measures to prevent additional damage; recovery excavations; museum curation; preparation of a report documenting the find; and development of public outreach or educational materials or displays. SPPC would be responsible for ensuring that the recommendations of the treatment plan are implemented.

#### *Residual Impacts*

Although the transmission line maintenance roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

**Alternative 1***Direct Impacts*

Alternative 1 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 1 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Indirect Impacts*

Alternative 1 would involve the same or similar indirect impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 1 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Mitigation and Monitoring Measures*

Alternative 1 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 1 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Residual Impacts*

Although the transmission line roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

**Alternative 2***Direct Impacts*

Alternative 2 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 2 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Indirect Impacts*

Alternative 2 would involve the same or similar indirect impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 2 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Mitigation and Monitoring Measures*

Alternative 2 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 2 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Residual Impacts*

Although the transmission line roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

**Alternative 3 (Preferred)***Direct Impacts*

Alternative 3 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 3 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Indirect Impacts*

Alternative 3 would involve the same or similar indirect impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 3 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Mitigation and Monitoring Measures*

Alternative 3 would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative 3 as those described for the Proposed Action, and the same mitigation strategy would apply.

*Residual Impacts*

Although the transmission line roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

**Macari Fiber Optic Alternative***Direct Impacts*

The Macari Fiber Optic Alternative would involve the same or similar direct impacts as those described for the Proposed Action.

*Indirect Impacts*

The Macari Fiber Optic Alternative would involve the same or similar indirect impacts as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Impacts on paleontological resources would essentially be the same under the Macari Fiber Optic Alternative as those described for the Proposed Action, and the same mitigation strategy would apply.

*Residual Impacts*

No residual impacts are expected under the Macari Fiber Optic Alternative.

**No Action Alternative**

Under the No Action Alternative, the BLM would continue to manage paleontological resources in compliance with federal laws and regulations. Because the Proposed Action would not be constructed, construction-related impacts would be avoided.

**Ormat Project Area****Proposed Action**

As discussed in **Section 3.15**, Paleontological Resources, it is unlikely that the Proposed Action would affect geologic units that have the potential to contain paleontological resources. Though many of the activities involved with the Proposed Action would result in some degree of ground disturbance, the presence of Quaternary alluvium and playa deposits and Tertiary volcanic deposits have low potential to contain paleontological resources.

*Direct Impacts*

If paleontological resources are present within the Ormat Project Area, impacts on those resources are more likely to occur where ground disturbance takes place and the work site has not experienced substantial prior disturbance. The greatest concern would be new construction activities, which are likely to occur on previously undisturbed or largely undisturbed, parcels. Substantial damage to or destruction of paleontological resources, as defined by BLM, would represent an impact to those resources. In most cases, new minor construction would require preparation of a site-specific paleontological investigation.

*Indirect Impacts*

No indirect impacts on paleontological resources are expected to result from the continuing operation of the Proposed Action.

*Mitigation and Monitoring Measures*

Pleistocene and early Holocene surficial deposits, such as alluvium, colluvium, talus, and playa deposits, have a low paleontological sensitivity ranking. Monitoring would not be required, but spot-checking may be conducted in certain areas at the discretion of the BLM Staff Paleontologist. In the case of the Quaternary deposits, this would ensure that any older underlying fossiliferous sediments were not being affected.

If paleontological localities are identified in the Ormat Project Area the following mitigation and monitoring measures would be implemented:

- I. Include site-specific evaluation of paleontological sensitivity for construction or maintenance activities requiring ground disturbance. For any construction or maintenance activity that requires ground disturbance Ormat would ensure that preconstruction studies include assessment of the site's paleontological sensitivity by a state-registered PG or qualified professional paleontologist. If the

paleontological assessment determines that any of the substrate units that would be affected by the planned activity are highly sensitive for paleontological resources, the report would also include recommendations for appropriate and feasible procedures to avoid or minimize damage to any resources present, prepared by a qualified professional paleontologist. Ormat would be responsible for ensuring implementation of the measures identified.

The potential for impacts on paleontological resources as a result of construction or maintenance activities is lower because ground disturbance associated with these activities is typically confined to existing ROWs and immediately adjacent areas, which have already undergone some level of disturbance associated with installation and maintenance of existing infrastructure. To ensure that further ground disturbance does not result in additional damage to paleontological resources, Ormat would also implement the following measure for all activities except emergency repairs; note that this measure would also ensure against impacts as a result of any new minor construction not subject to site-specific geotechnical investigation.

2. Stop work if substantial fossil remains are encountered during construction. If substantial fossil remains (particularly vertebrate remains) are discovered during construction or maintenance activities, work on the site would stop immediately until a state-registered PG or qualified professional paleontologist can assess the nature and importance of the find and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may also include preparation of a report for publication describing the finds. Ormat or the BLM would be responsible for ensuring that recommendations regarding treatment and reporting are implemented.

If emergency repairs are needed, Ormat would conduct repairs as rapidly as possible to ensure continuity of service and to protect public safety. As a result, it is typically infeasible to implement a stop work order, such as that required under Mitigation Measure 2, during emergency repairs. By their nature, emergency repairs affect existing infrastructure and thus would take place in ROWs and immediately adjacent areas that have already undergone some level of disturbance associated with installation and maintenance of existing utilities infrastructure. Consequently, the potential for impacts as a result of emergency repairs is considered low, but

some potential nonetheless remains. Implementation of the following measure would reduce impacts on the extent feasible.

3. Implement follow-up assessment and remediation in the event paleontological resources are discovered during emergency repairs. If paleontological resources are discovered during emergency repairs, Ormat would ensure that they are evaluated by a state-registered PG or qualified professional paleontologist as soon as practicable following the completion of all necessary and required repair work. If appropriate, a qualified professional paleontologist would develop a remedial treatment plan consistent with the prevailing standard of care for paleontological resources. The treatment plan may provide for any or all of the following: measures to prevent additional damage; recovery excavations; museum curation; preparation of a report documenting the find; and development of public outreach or educational materials or displays. Ormat would be responsible for ensuring that the recommendations of the treatment plan are implemented.

#### *Residual Impacts*

Although the well pads, associated pipelines, the Carson Lake Binary Power Plant and Substation, transmission line roadway, and access roads associated with the Proposed Action would not be public and are meant for operation and inspection purposes only, these operations could provide potential roadways for access to paleontological localities.

### **Alternative I (Preferred)**

#### *Direct Impacts*

Alternative I would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

#### *Indirect Impacts*

Alternative I would involve the same or similar indirect impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

#### *Mitigation and Monitoring Measures*

Alternative I would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

*Residual Impacts*

Although the transmission line roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

**No Action Alternative**

Under the No Action Alternative, the BLM would continue to manage paleontological resources in compliance with federal laws and regulations. Because the Proposed Action would not be constructed, construction-related impacts would be avoided.

**Vulcan Project Area****Proposed Action (Preferred)**

As discussed in **Section 3.15, Paleontological Resources**, it is unlikely that the Proposed Action would affect geologic units that have the potential to contain paleontological resources. Though many of the activities involved with the Proposed Action would result in some degree of ground disturbance, the presence of Quaternary alluvium and playa deposits and Tertiary volcanic deposits have low potential to contain paleontological resources.

*Direct Impacts*

If paleontological resources are present within the Vulcan Project Area, impacts on those resources are more likely to occur where ground disturbance takes place and the work site has not experienced substantial prior disturbance. The greatest concern would be new construction activities, which are likely to occur on previously undisturbed or largely undisturbed parcels. Substantial damage to or destruction of paleontological resources, as defined by BLM, would represent an impact to those resources. In most cases, new minor construction would require preparation of a site-specific paleontological investigation.

*Indirect Impacts*

No indirect impacts on paleontological resources are expected to result from the continuing operation of the Proposed Action.

*Mitigation and Monitoring Measures*

Pleistocene and early Holocene surficial deposits, such as alluvium, colluvium, talus, and playa deposits, have a low paleontological sensitivity ranking. Monitoring would not be required, but spot-checking may be conducted in certain areas at the discretion of the BLM Staff Paleontologist. In the case of the Quaternary deposits, this would ensure that any older underlying fossiliferous sediments were not being affected.

If paleontological localities are identified in the Vulcan Project Area the following mitigation and monitoring measures would be implemented:

1. Include site-specific evaluation of paleontological sensitivity for construction or maintenance activities requiring ground disturbance. For any construction or maintenance activity that requires ground disturbance Vulcan would ensure that preconstruction studies include assessment of the site's paleontological sensitivity by a state-registered PG or qualified professional paleontologist. If the paleontological assessment determines that any of the substrate units that would be affected by the planned activity are highly sensitive for paleontological resources, the report would also include recommendations for appropriate and feasible procedures to avoid or minimize damage to any resources present, prepared by a qualified professional paleontologist. Vulcan would be responsible for ensuring implementation of the measures identified.

The potential for impacts on paleontological resources as a result of construction or maintenance activities is lower, because ground disturbance associated with these activities is typically confined to existing ROWs and immediately adjacent areas, which have already undergone some level of disturbance associated with installation and maintenance of existing infrastructure. To ensure that further ground disturbance does not result in additional damage to paleontological resources, Vulcan would also implement the following measure for all activities except emergency repairs; note that this measure would also ensure against impacts as a result of any new minor construction not subject to site-specific geotechnical investigation.

2. Stop work if substantial fossil remains are encountered during construction. If substantial fossil remains (particularly vertebrate remains) are discovered during construction or maintenance activities, work on the site would stop immediately until a state-registered PG or qualified professional paleontologist can assess the nature and importance of the find and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection, and may also include preparation of a report for publication describing the finds. Vulcan or the BLM would be responsible for ensuring that recommendations regarding treatment and reporting are implemented.

If emergency repairs are needed, SPPC would conduct repairs as rapidly as possible to ensure continuity of service and to protect public safety. As a result, it is typically infeasible to implement a stop work order, such as that required under Mitigation Measure 2, during emergency repairs. By their nature, emergency repairs affect

existing infrastructure and thus would take place in ROWs and immediately adjacent areas that have already undergone some level of disturbance associated with installation and maintenance of existing utilities infrastructure. Consequently, the potential for impacts as a result of emergency repairs is considered low, but some potential nonetheless remains. Implementation of the following measure would reduce impacts on the extent feasible.

3. Implement follow-up assessment and remediation in the event paleontological resources are discovered during emergency repairs. If paleontological resources are discovered during emergency repairs, Vulcan would ensure that they are evaluated by a state-registered PG or qualified professional paleontologist as soon as practicable following the completion of all necessary and required repair work. If appropriate, a qualified professional paleontologist would develop a remedial treatment plan consistent with the prevailing standard of care for paleontological resources. The treatment plan may provide for any or all of the following: measures to prevent additional damage; recovery excavations; museum curation; preparation of a report documenting the find; and development of public outreach or educational materials or displays. Vulcan would be responsible for ensuring that the recommendations of the treatment plan are implemented.

#### *Residual Impacts*

Although power plant access routes would not be public and are meant for operation and inspection purposes only, these operations could provide potential roadways for access to paleontological localities.

### **Alternative I**

#### *Direct Impacts*

Alternative I would involve the same or similar direct impacts as those described for the Proposed Action and for the action proposed by SPPC for the Bass Flat Switching Station. Consequently, impacts on paleontological resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

#### *Indirect Impacts*

Alternative I would involve the same or similar indirect impacts as those described for the Proposed Action. Consequently, impacts on paleontological resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

#### *Mitigation and Monitoring Measures*

Alternative I would involve the same or similar direct impacts as those described for the Proposed Action. Consequently, impacts on paleontological

resources would essentially be the same under Alternative I as those described for the Proposed Action, and the same mitigation strategy would apply.

#### *Residual Impacts*

Although the transmission line roadway would not be public and is meant for operation and inspection purposes only, it could be a potential roadway for access to paleontological localities.

#### **No Action Alternative**

Under the No Action Alternative, the BLM would continue to manage paleontological resources in compliance with federal laws and regulations. Because the Proposed Action would not be constructed, construction-related impacts would be avoided.

## **4.17 VISUAL RESOURCES**

### **Summary**

#### **Assessment Methodology**

Potential impacts on visual resources are analyzed by assessing direct and indirect impacts from actions that would change the visual resources and scenic quality by either introducing intrusions into the landscape or, conversely, protecting the landscape from such visual intrusions.

The BLM VRM Class Objectives are used in analyzing impacts on visual resources. These objectives provide a baseline for determining how much a proposed action would affect visual resources and scenic quality, as well as determining the level of disturbance an area can support while still meeting visual resource objectives. The BLM VRM Class Objectives and descriptions are described in detail in BLM Handbook H-8431-I, Visual Resource Contrast Rating (BLM 1986).

The criteria for analysis are the number of acres proposed for designation under the VRM classes and the level of impacts and surface disturbances permitted under each class. At the broad-scale level, analysis of the impacts on visual resources is discussed in terms of the number of acres in each VRM class, because the proposed actions would be required to comply with the designated VRM Class Objectives within the Stillwater Field Office area.

Impacts occur if actions result in not meeting the objectives of the designated VRM class. The land directly associated with the proposed project has been classified as Class III by the BLM. Class III objectives are to partially retain the existing character of the landscape. The level of change to the landscape is determined by the BLM contrast rating system, which is described in BLM Handbook H-8431-I, Visual Resource Contrast Rating (BLM 1986).

The contrast rating process includes obtaining a project description, verifying VRM objectives, selecting Key Observation Points (KOPs), preparing visual simulations, and completing the contrast rating from those key observation points. This rating was completed in the field by a team trained and qualified in the BLM VRM process. The degree of contrast can be rated as none, weak, moderate, or strong. Factors taken into consideration when making this rating are viewing distance, angle, relative size, or scale, and spatial relationships. The Proposed Action and Alternatives are rated against the existing landscape for form, line, color, and texture.

### ***Indicators***

Potential visual impacts associated with the project are identified and assessed according to criteria listed previously. The primary indicators of visual impacts would be the visual simulations and contrast ratings worksheets that were completed at key observation points. These define visual resources impacts.

Immediate and cumulative visual impacts would be considered when assessing environmental consequences. Since the Proposed Action includes infrastructure and there is an existing geothermal facility in place and several more proposed for the area, the cumulative impacts of these developments would be evaluated together.

Indicators include:

- Views of the project from key observation points, which include Grimes Point Lookout, the Pony Express National Historic Trail, and Highway 50. The level of viewer exposure measured in time from Highway 50 would be considered.
- Views of the project from area roadways, and viewing areas from the perspective of hunters, OHVs, and general recreationists on public lands.
- Views of the project from sensitive receptors, such as schools.
- Projected contrast to the existing landscape as a result of the Proposed Action and Alternatives. This would include consideration of the design color and site locations of plants and associated structures, lighting and security fencing, and the placement of access roads.

### ***Region of Influence***

The ROI for visual resources is the viewshed surrounding the SPPC, Ormat, and Vulcan Project Areas.

## SPPC Project Area

### ***Proposed Action***

Where the transmission line would follow roads, generally from the Greenwave Substation to the Macari Switching Station, the single-pole structures used for the transmission line, the visual impacts would be more apparent since they are more heavily traveled. Along roads where poles would be visible, the transmission line corridor is on land not owned by BLM, but there are some points along the corridor that include BLM and Reclamation land.

The proposed 60-kV electric line fold across the street from the new Greenwave Substation would fold into an existing line runs along Sheckler Road and approximately 200 feet from the Lahontan Elementary School campus. Since the electric line fold is tying into existing poles along two transmission lines, it would not be visible to the casual observer from the road or the school. The four new single-pole angle structures across Sheckler Road would be visible from the road but would be close enough to the existing poles that there would not be much of a change in the visual character of the area. The new poles would not be visible or barely visible from the school, as there is a vegetated buffer along the edge of the school property and the poles are more than 0.5 mile away.

The two proposed switching stations, the Bass Flat Switching Station and Pony Express Switching Station, would be built immediately adjacent to existing structures on BLM land. The Greenwave Substation would be on privately owned land. The substation would be larger than the two switching stations, and would cover more land area. The switching stations and substation would be visible from the existing structures in the immediate area.

### ***Direct Impacts***

The visual contrast rating stage (described in BLM Handbook H-8431-1, Visual Resource Contrast Rating, BLM 1986) involves determining whether potential visual impacts from the Proposed Action or Alternatives would conform to management objectives established for the area or whether design adjustments would be required. Foreseeable direct impacts were determined after reviewing contrast rating worksheets and producing visual simulations from KOPs. Figures in **Appendix J**, Visual Simulations, show the existing and simulated views at KOPs for the Proposed Action (Figure 3-21, Cultural and Visual Resources). **Figures J-1 through J-10** are relevant to the SPPC Project Area.

**Figures J-1**, Observation Point 1, Existing View and **J-2**, Simulated View of Proposed Action, show a northwestern view from Highway 50. The transmission line would barely be visible from this distance, but appears in the distant middle ground, between three to five miles away. There would be a faint view of the transmission line from this distance.

**Figures J-3, Key Observation Point 2, Existing View and J-4, Simulated View of Proposed Action**, show a southwestern view from the Grimes Point Lookout. Viewers from this lookout point represent sensitive receptors. The proposed transmission line would be visible in the middle ground, between 0.5 to five miles away, from the lookout. The Macari Switching Station would also be slightly visible from the point. Naval Air Station Fallon, industrial, and residential structures are also currently visible in the middle ground from the lookout point. The transmission line and substation would require some mitigation measures to reduce visual impacts.

**Figures J-5, Key Observation Point 3, Existing View and J-6, Simulated View of Proposed Action**, show a southward view from across Sheckler Road. The simulation depicts a view of the proposed Greenwave Substation. The substation would be a visual change for the site, as it is an undeveloped field. Night lighting would not be used during the normal operation of the substation, and would be limited to emergency maintenance or repairs, so there would be minimal change in regard to lighting aesthetics. The new single-pole structures would also be a visual change, but the new poles would not alter the visual character of the area. There would also be visual impacts along Macari Lane and Highway 95. The area surrounding the proposed substation and electric line fold is developed with transmission lines, buildings, paved roads, and another substation approximately 0.75 mile away. The proposed substation would be a visible cultural modification and permanent change that would require mitigation.

**Figures J-7, Key Observation Point 4, Existing View and J-8, Simulated View of Proposed Action**, show a western view towards the existing ENEL Geothermal Power Plant. The SPPC proposed transmission line would be visible. This simulation shows the H-frame structures that would be used in rural areas along the 230-kV transmission line. This expanse is rural in character, and H-frame structures would only be accessible by remote and rarely used roads (often unpaved). Due to the remote nature of the land and the dark color of the H-frame structures, the transmission line would be visible to very few people. The poles would be wood and would blend in with the colors of the hills and background landscape. The proposed transmission line may be visible to people using off-road vehicles and OHVs for recreational purposes in the area. These uses are only intermittent and the visual impacts would be temporary.

**Figures J-9, Key Observation Point 5, Existing View and J-10, Simulated view of Proposed Action** show a northwestern view from Macari Lane. The proposed SPPC transmission line would connect into the proposed Carson Lake Binary Power Plant and would continue east and south from privately owned land onto BLM land. There is an existing transmission line along the road. The Proposed Action would result in a visual impact for the area, but most of the impacts are associated with the power plant and not the transmission line. The proposed transmission line would impact the view; however the road already has cultural

modifications in view including transmission lines, industrial structures, and Naval Air Station Fallon.

**Figures J-18**, Key Observation Point 8, Exiting View and **J-19**, Simulated view of Proposed Action show a northern view from the Pony Express National Historic Trail. The proposed SPPC transmission line would connect into the proposed Pony Express Switching Station. There is an existing geothermal power plant north and east of KOP 8. However, the Proposed Action would result in a visual impact for the area and for the Pony Express National Historic Trail. Most of the impacts are associated with the Pony Express Switching Station and not the transmission line. Mitigation measures would be required to reduce impacts on the viewshed from the Pony Express National Historic Trail.

In sparsely developed and undeveloped areas, the poles, lines, switching station, and substations would be too distant to see from most areas frequented by the public. The new structures would at times be obstructed by hills, only visible for limited viewing times, or would be constructed in an existing utility corridor. This would result in temporary impacts. However, there would be locations where more apparent impacts on visual resources would occur. The Proposed Greenwave Substation on Sheckler Road would be an impact on the existing visual landscape. The Sheckler Road area is not BLM land but is well traveled, and the visual properties of the area would be changed. The proposed transmission line would be visible at some points along both Sheckler Road and Highway 95. The Pony Express Switching Station would be an impact to horseback riders utilizing the Pony Express National Historic Trail. In all of the instances where there would be visual impacts, there are other cultural modifications in the area or surrounding. The overall visual impact of the Proposed Action would vary along the highway.

There would also be various temporary direct impacts during construction of the transmission line. SPPC would require a 300-foot-wide ROW for the transmission line. Each transmission structure would require temporary work pads. Numerous stringing sites, three staging areas of approximately 5 acres, and access roads would also be needed during construction. All of these temporary areas, including access roads, would be recontoured, decompacted, and seeded or left in place as directed by the BLM or landowner. These visual impacts would be temporary.

#### *Indirect Impacts*

Reasonably foreseeable indirect impacts that may or may not occur are an increase in development, if the project is built, or an increase in OHV use and visual land alteration due to access roads associated with the project. It is possible that if the Proposed Action or any of the project Alternatives are constructed, more development, such as other energy, infrastructural, industrial, commercial, or residential projects would be built in the same area. This may or may not result in a visual change in landscape character. Another indirect impact

would be possible increased OHV and vehicle use along access roads associated with project infrastructure. This would result in an increase in ground scarring and leave a visible disturbance on the ground surface, vegetation, and color.

#### *Mitigation and Monitoring Measures*

Transmission line poles and cross arms similar in color to surrounding landscapes would be used whenever possible. The H-frame structures and steel single-pole structures would be aesthetically and structurally similar to existing poles. Substation and switching station design would use low profile components. Screening berms or landscaping would surround the substation whenever feasible to make it less visible from Sheckler Road and Highway 95. The fencing materials and structures associated with the substation would be nonreflective when possible. Also, equipment would be painted a BLM-approved color to blend in with predominant vegetation and soil whenever feasible. Existing vegetation on the substation site would be preserved to the extent possible and disturbed areas would be revegetated wherever possible.

#### *Residual Impacts*

This level of change, after including mitigation measures, to visual resources from the Proposed Action would conform to changes allowed in areas with a Class III VRM designation.

#### ***Alternative I***

Alternative I would avoid most of the existing conservation easements, which have 80-foot height restrictions and have restrictions that uses must support agriculture. Constructing the transmission line in this configuration would have approximately the same amount of visibility as the Proposed Action, as the roads are similar in traffic flow. The southern portion of the transmission line would run approximately 0.5 miles further south than the Proposed Action, which would make the line slightly less visible from Macari Lane.

#### *Direct Impacts*

Views from KOPs 1, 2, 3, 4, 5, and 8 would be the same as the Proposed Action. Alternative I would have visual impacts similar to the Proposed Action as they both are located with distance from well-traveled roads and places that would be most visible to the public.

#### *Indirect Impacts*

Indirect impacts from Alternative I would be the same as the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as the Proposed Action.

*Residual Impacts*

This level of change, after including mitigation measures, to visual resources from Alternative 1 would conform to changes allowed in areas with a Class III VRM designation.

**Alternative 2**

Alternative 2 would have very similar impacts on the Proposed Action except would be more visible along Macari Lane. Macari Lane does have existing transmission lines, so the new transmission line would not change visually.

*Direct Impacts*

Views from KOPs 1, 2, 3, 4, 5, and 8 would be the same as the Proposed Action. Alternative 2 would be slightly more visible than the Proposed Action, but only along Macari Lane.

*Indirect Impacts*

Indirect impacts from Alternative 2 would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative 1 would be the same as the Proposed Action.

*Residual Impacts*

This level of change, after including mitigation measures, to visual resources from Alternative 2 would conform to changes allowed in areas with a Class III VRM designation.

**Alternative 3 (Preferred)**

Alternative 3 would avoid bisecting the existing Corkill Ranch conservation easement and continue along Macari Lane in the same manner as Alternative 2. Constructing the transmission line in this configuration would have approximately the same amount of visibility as Alternative 2 as the roads are similar in traffic flow. The southwestern portion of the transmission line would run south of the Corkill Ranch property, which would make the line slightly less visible from Macari Lane area but more visible from the western boundary of Carson Lake and Pasture.

*Direct Impacts*

Views from KOPs 1, 2, 3, 4, 5, and 8 would be the same as the Proposed Action. Alternative 3 would have visual impacts similar to the Proposed Action as they both are located with distance from well-traveled roads and places that would be most visible to the public.

*Indirect Impacts*

Indirect impacts from Alternative 3 would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative 3 would be the same as the Proposed Action.

*Residual Impacts*

This level of change, after including mitigation measures, to visual resources from Alternative 3 would conform to changes allowed in areas with a Class III VRM designation.

**Macari Fiber Optic Alternative**

In this Alternative, the transmission line route would be the same as for the Proposed Action or chosen Alternative. The Alternative then includes a fiber optic cable going east-west along Macari Lane that would be routed in an underground trench. The cable pulling vaults on either side of the Fallon Canal and highway crossings would allow the cable to run above ground across the canal and highways and would be visible.

*Direct Impacts*

This Alternative would have slightly more visual impacts than the Proposed Action and Alternatives since the underground cable would not be visible above ground but the crossings would be visible.

*Indirect Impacts*

Indirect impacts from the Macari Fiber Optic Alternative would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for the transmission line would be the same as for the Proposed Action and Alternatives. The materials and components associated with the fiber optic line would be low-profile whenever possible. Also, equipment would be painted a BLM-approved color to blend in with predominant vegetation and soil whenever feasible. Existing vegetation on the substation site would be preserved to the extent possible and disturbed areas would be revegetated wherever possible.

*Residual Impacts*

This level of change, after including mitigation measures, to visual resources from the Macari Fiber Optic Alternative would conform to changes allowed in areas with a Class III VRM designation.

**No Action Alternative**

Under the No Action Alternative, none of the transmission lines, substations, or associated structures would be built and there would be no impact on visual resources.

## Ormat Project Area

### ***Proposed Action***

The binary power plant structures would consist of structures that range from 35 to 52 feet. During times of high humidity, there would be some water vapor released from the cooling tower that would be visible. The power plant would be visible from Macari Lane (KOP 5) and visible from the Grimes Point Lookout (KOP 2). The power plant is located adjacent to BLM land, so it would be visible from public land.

The Carson Lake Binary Power Plant and Substation and Macari Switching Station would be visible from Macari Lane (KOP 5) but barely visible from the Grimes Point Lookout (KOP 2).

The 200-foot 230-kV transmission line connecting the Carson Lake Substation to the Macari Switching Station would be visible from Macari Lane (KOP 5) but barely visible from Grimes Point Lookout (KOP 2).

Insulated pipelines would also be required as part of the Proposed Action. These pipelines would be located on mostly BLM lands. The pipeline system would vary in diameter from 20 to 30 inches and would be 19.2 miles in length. The top of pipes would be approximately three feet high. The proposed pipelines connecting the wells would be visible from area roads. Approximately 4.6 miles of access roads would be constructed adjacent to pipeline corridors. Pipelines would generally follow proposed access roads, but could also be located within any areas identified in Figure 2-7, Ormat Proposed and Alternative Project Facilities. The pipeline and road corridors would be slightly visible in the distant middle ground from the Grimes Point Lookout. Road crossings and irrigation canal crossings would be developed to provide sufficient vertical clearance and would follow the Bureau of Reclamation Design Engineering and O&M Guidelines for crossings. The crossings would be approximately 20 feet in height and would be visible on BLM land and slightly visible from Grimes Point Lookout.

The well pads and production, injection, or observation wells would be most visible from area roads and only slightly from the Grimes Point Lookout.

### ***Direct Impacts***

The visual contrast rating stage (described in BLM Handbook H-8431-1, Visual Resource Contrast Rating, BLM 1986) involves determining whether potential visual impacts from the Proposed Action or Alternatives would conform to management objectives established for the area or whether design adjustments would be required. Foreseeable direct impacts were determined after reviewing contrast rating worksheets and producing visual simulations from KOPs. Figures in **Appendix J** show the existing and simulated views at KOPs for the Proposed Action. **Figures J-1, J-2, J-3, J-4, J-9 and J-10** are relevant to the Ormat Project Area.

**Figures J-3**, Key Observation Point 2, Existing View and **J-4**, Simulated View of Proposed Action, show a southwestern view from Grimes Point Lookout. Viewers from this lookout point represent sensitive receptors. The Carson Lake Binary Power Plant and associated structures would be visible in the middle ground, between 0.5 to five miles away, from the lookout. Naval Air Station Fallon, industrial, and residential structures are also currently visible in the middle ground from the lookout point. The power plant would require some mitigation measures to reduce visual impacts.

**Figures J-9**, Key Observation Point 5, Existing View and, **J-10**, Simulated View of Proposed Action, show a northwestern view from Macari Lane. The Carson Lake Binary Power Plant and associated structures are visible and represent a change from existing conditions. The area is currently an undeveloped field on private land and is directly adjacent to BLM land. Macari Lane has a low flow of traffic and NAS Fallon is visible in the middle ground, or less than five mile viewshed. The power plant and associated structures would be visible in the foreground, or less than 0.5 mile, from Macari Lane and would require mitigation measures to reduce visual impacts.

The Ormat Proposed Action would have visual impacts on public land. Viewsheds from Grimes Point Lookout and Macari Lane would be affected, however, the Proposed Action would meet VRM Class III standards. There is some development in the Macari Lane area, but the Carson Lake Binary Power Plant and associated structures, well pads, and pipelines would be a noticeable change to the visual features and character of the rural area. The power plant, in particular, is visible and a very noticeable change. The Grimes Point Archaeological Site is a sensitive receptor, and the power plant area would be visible and may be disruptive to recreational visitors and sightseers. The pipeline corridor and 26 possible well pads would also be a noticeable change to the area, and would be most apparent from area roads. The overall visual impact from the Proposed Action would vary in different areas. There would be a visual impact on views from Grimes Point Lookout and on BLM land east of Macari Lane.

There would also be various temporary direct impacts during construction of the Proposed Action. Grading and filling would be required for the site and would take 3-4 weeks. Equipment would be delivered to the site on trucks from US Highway 50 via Macari Lane. Construction of the substation, switching station, and transmission line would be similar to the process described under the SPPC Proposed Action. Construction of the pipeline corridor would require additional access roads and structural supports over the entire length of the corridor. These temporary construction activities would not likely impact visual resources since the area is rural.

*Indirect Impacts*

Reasonably foreseeable indirect impacts that may or may not occur are an increase in development if the project is built, or an increase in OHV use and visual land alteration due to access roads associated with the project. It is possible that if the Proposed Action or the project Alternative is constructed, more development, such as other energy, infrastructural, industrial, commercial, or residential projects would be built in the same area. This would result in a visual change in landscape character, since the present state of the Project Area is rural and fairly remote. Another indirect impact would be possible increased OHV and vehicle use along access roads associated with project infrastructure. This would result in an increase in ground scarring and leave a visible disturbance on the ground surface, vegetation, and color.

*Mitigation and Monitoring Measures*

All equipment would be painted a BLM-approved color to blend in with predominant vegetation and soil whenever feasible. Screening berms or landscaping would surround the power plant site and well sites whenever feasible to make them less visible from Macari Lane and Grimes Point Lookout. The fencing materials and structures associated with the power plant site and associated structures would be nonreflective when possible. Substation, switching station, and pipeline design would use low profile components. Transmission line poles and cross arms similar in color to surrounding landscapes would be used whenever possible. The pole structures would be aesthetically and structurally similar to existing poles in the area. Existing vegetation on the substation site would be preserved to the extent possible and disturbed areas would be revegetated wherever possible.

*Residual Impacts*

The Ormat Project Area Proposed Action would have visual impacts in certain areas, however, it would meet BLM VRM Class III objectives. These areas include viewsheds from Grimes Point Lookout and BLM land east of Macari Lane. Assuming all structures follow mitigation measures, these impacts would be reduced.

***Alternative 1 (Preferred)***

An Alternative to the Proposed Action relocates two well sites and that portion of the pipeline. This Alternative would have the same visual impact as the Proposed Action. The relocated well sites and pipeline would be approximately the same distance from traveled roads, recreational areas, and sensitive receptors.

*Direct Impacts*

Views from KOPs 2 and 5 would be the same as the Proposed Action. There would be a visual impact on views from Grimes Point Lookout and on BLM land east of Macari Lane.

*Indirect Impacts*

Indirect impacts from Alternative I would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as the Proposed Action.

*Residual Impacts*

This Alternative would have the same visual impacts as the Proposed Action. In certain areas, Alternative I would not meet BLM Class III objectives. These areas include viewsheds from Grimes Point Lookout and BLM land east of Macari Lane. Assuming all structures follow mitigation measures, the remaining portions of the project would meet BLM Class III management objectives.

**No Action Alternative**

Under the No Action Alternative, none of the Ormat Project Area Proposed Action would be built, and there would be no impact on visual resources.

**Vulcan Project Area*****Proposed Action (Preferred)***

Vulcan proposes to utilize Power Plant Sites 3 and 5 for potential flash power plant facilities. Flash power plants have more of a visual impact as they release steam. Flash power plants would be visible further away than binary power plants. Power Plant Site 5 and associated structures would be visible from the Pony Express National Historic Trail.

*Direct Impacts*

The visual contrast rating stage (described in BLM Handbook H-8431-1, Visual Resource Contrast Rating, BLM 1986) involves determining whether potential visual impacts from the Proposed Action or Alternatives would conform to management objectives established for the area or whether design adjustments would be required. Foreseeable direct impacts were determined after reviewing contrast rating worksheets and producing visual simulations from KOPs. Figures in **Appendix J** show the existing and simulated views at KOPs for the Proposed Action. **Figures J-1, J-2, and J-11 through J-17** are relevant to the Vulcan portion of the project.

**Figures J-1, Key Observation Point 1, Existing View and J-2, Simulated View of Proposed Action**, show a northwestern view from Highway 50. The project is barely visible from this distance, but the faint outline of two of the power plants may appear in the horizon.

**Figures J-11 through J-15, Key Observation Point 6**, show a northern view from the Pony Express National Historic Trail in which power plant 5 would be visible. This may be a flash or a binary power plant. Either power plant would have a visual impact, but a flash power plant would have more effects than a

binary power plant. The steam released from a flash power plant would be visible from further away and cause more of a visual disturbance than a binary power plant. An Alternative includes a transmission line that intersects the Pony Express National Historic Trail, which would be visible from this Key Observation Point. These impacts would occur even though the area has low accessibility and is very remote. Mitigation measures would be required to reduce impacts on the viewshed from the Pony Express National Historic Trail.

**Figures J-16**, Key Observation Point 7, Exiting View and **J-17**, Simulated View of Proposed Action show a western view from Highway 50. Power Plant Sites 1 and 4, several well pads, and the pipeline corridor are visible from this point. The power plants are visible and Highway 50 is a well-traveled road. The existing viewshed is only slightly developed by existing geothermal infrastructure and would be disrupted by the proposed project. These proposed modifications would result in a visual change and would require mitigation.

Viewsheds from Highway 50 and the Pony Express National Historic Trail would be affected by the Vulcan Proposed Action. There is very little development visible surrounding Highway 50 southeast of Fallon, although the existing ENEL Geothermal Power Plant and several transmission lines are visible. The four proposed power plants and associated structures, well pads, and pipelines would be a noticeable change to the visual features and character of the mostly undeveloped area. Power Plant Sites 1 and 4, in particular, are visible from the highway and a noticeable change. The pipeline corridor and 26 possible well pads would also be a noticeable change to the area, and would also be somewhat visible from Highway 50. The Pony Express National Historic Trail area is a sensitive receptor and the binary or flash power plant, associated structures, and Alternative transmission line would be visible and may be disruptive to recreational visitors and sightseers. The overall visual impact of the Proposed Action would vary. There would be visual impacts from the Pony Express National Historic Trail and some points along Highway 50.

There would also be various temporary direct impacts during construction of the Proposed Action. Grading and filling would be required for the site and would take 3-4 weeks. Equipment would be delivered to the site on trucks from US Highway 50 via Macari Lane. Construction of the substation, switching station, and transmission line would be similar to the process described under the SPPC Proposed Action. Construction of the pipeline corridor would require additional access roads and structural supports over the entire length of the corridor. These temporary construction activities would not impact visual resources since the area is primarily undeveloped.

#### *Indirect Impacts*

Reasonably foreseeable indirect impacts that may or may not occur are an increase in development if the project is built, or an increase in OHV use and visual land alteration due to access roads associated with the project. It is

possible that if the Proposed Action or the project Alternative is constructed, more development, such as other energy, infrastructural, industrial, commercial, or residential projects would be built in the same area. This would result in a visual change in landscape character, since the present state of the Project Area is rural and fairly remote. Another indirect impact would be possible increased OHV and vehicle use along access roads associated with project infrastructure. This would result in an increase in ground scarring and leave a visible disturbance on the ground surface, vegetation, and color.

#### *Mitigation and Monitoring Measures*

All equipment would be painted a BLM-approved color to blend in with predominant vegetation and soil whenever feasible. Screening berms or landscaping would surround the power plant site and well sites whenever feasible to make them less visible from Macari Lane. The fencing materials and structures associated with the power plant site and associated structures would be nonreflective when possible. Substation, switching station, and pipeline design would use low profile components. Transmission line poles and cross arms similar in color to surrounding landscapes would be used whenever possible. The pole structures would be aesthetically and structurally similar to existing poles in the area. Existing vegetation on the substation site would be preserved to the extent possible and disturbed areas would be revegetated wherever possible.

#### *Residual Impacts*

In some areas, the Proposed Action would not meet BLM Class III objectives. These areas of visual impact are portions of the project that can be seen from the Pony Express National Historic Trail and some parts of Highway 50. The visual changes proposed by Vulcan are compatible with BLM objectives for a Class III VRM area, provided that mitigation measures are included.

#### ***Alternative I***

An Alternative to the Proposed Action would happen if SPPC elects not to build the proposed project. In this event, Vulcan would build the Bass Flat Switching Station. The proposed interconnection transmission line would then be extended from Power Plant Site 5 to that switching station. The transmission line would be constructed adjacent to an existing road and the switching station would be constructed in similar to the ones described under the SPPC project.

#### *Direct Impacts*

**Figure J-12**, Key Observation Point 6, Simulated View of Proposed Action with Binary Plant, a simulation of this Alternative, is a northward view from the Pony Express National Historic Trail. The proposed transmission line is visible and a noticeable change from existing conditions. The proposed flash power plant is also visible in the middle ground, and has a visual impact.

The Pony Express National Historic Trail is a sensitive receptor and the proposed transmission line would be a highly visible change in the foreground viewshed from the trail.

*Indirect Impacts*

Indirect impacts from Alternative I would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Transmission line poles and cross arms similar in color to surrounding landscapes would be used whenever possible. The pole structures would be aesthetically and structurally similar to existing poles in the area. Existing vegetation on the substation site would be preserved to the extent possible and disturbed areas would be revegetated wherever possible.

*Residual Impacts*

Alternative I would not meet BLM Class III objectives. The visual impact from the proposed transmission line would be a highly noticeable change from the Pony Express National Historic Trail, a sensitive receptor.

**No Action Alternative**

Under the No Action Alternative, no part of Vulcan Project Area Proposed Action or its Alternative would be built and there would be no visual impacts.

## **4.18 LIVESTOCK GRAZING**

### **Summary**

**Assessment Methodology**

Grazing allotments overlapping the Salt Wells Energy Projects Area and the level of use, or AUMs, were identified using Geographical Information System data, BLM and Reclamation records and are outlined in Section 3.18, Livestock Grazing. The following steps were taken to analyze impacts on livestock grazing:

- Review Sierra Front-Northwestern Great Basin Standards and Guidelines for Rangeland Health;
- Using Geographical Information System technology, determine the approximate total area of land that would be lost to forage production within allotments due to construction and/or operation of the Project in both temporary and permanent time frames;
- Determine the number of AUMs lost in each affected allotment; and
- Determine any springs, water holes or other range improvements that would be affected by this action.

**Indicators**

The following indicators have been identified in order to evaluate potential project impacts on livestock grazing:

- Number of BLM and Reclamation livestock grazing allotments that have one or more elements of the project within them;
- The numbers of livestock currently using, or approved to use, these areas; and
- Locations of watering holes, springs, and other range improvements in relation to the direct effects area.

In order to compare effects associated with the Proposed Actions and Alternatives, these indicators were considered both independently and in conjunction with one another.

### ***Region of Influence***

The ROI for impacts on livestock grazing includes the BLM grazing allotments and Reclamation pastures that overlap with the proposed temporary and permanent disturbance areas (230-kV transmission line, pipelines, well pads, substations, interconnect transmission lines, switching stations, and power plants) on public land within the Salt Wells Energy Projects Area.

## **SPPC Project Area**

### ***Proposed Action***

#### ***Direct Impacts***

The SPPC Proposed Action directly impacts two BLM grazing allotments and the Carson Lake Pasture in two areas.

Direct impacts include a temporary loss of forage during construction (see **Table 4-15**, Approximate Acreage of Disturbance of Grazing Allotments or Pastures on Public Lands Under the SPPC Proposed Action and Alternatives). A portion of the forage base would be revegetated following construction of the transmission line. A smaller permanent loss of forage would occur in the footprint of the transmission poles and switching station sites, affecting less than 1 percent of available grazing acreage within the Rock Springs and Bass Flat Allotments. No AUMs would be lost resulting from the small amount of acreage removed from grazing under the Proposed Action.

Temporary harassment and displacement of cattle could also occur during the construction phase of the project. Livestock use patterns may change and livestock may also permanently avoid small localized areas as a result of the project. A variety of range improvements may also be found on land that the transmission line may follow. Range improvements include, but are not limited to, water sources, fences, and gates. In areas where construction of the transmission line and improvements coincide, sections may need to be removed or opened to accommodate construction traffic.

**Table 4-15**  
**Approximate Acreage of Disturbance of Grazing Allotments or Pastures on Public Lands**  
**Under the SPPC Proposed Action and Alternatives**

| <b>Allotment/ Pasture</b>             | <b>Temporary Disturbance<br/>(Acres)*</b> | <b>Permanent Disturbance<br/>(Acres)*</b> |
|---------------------------------------|---|---|
| <b>Proposed Action</b>                |   |   |
| Rock Springs                          | 224.75                                    | 96.75                                     |
| Bass Flat                             | 5.75                                      | 5.75                                      |
| <b>Alternative 1</b>                  |   |   |
| Rock Springs                          | 224.75                                    | 96.75                                     |
| Bass Flat                             | 5.75                                      | 5.75                                      |
| <b>Alternative 2</b>                  |   |   |
| Rock Springs                          | 224.75                                    | 96.75                                     |
| Bass Flat                             | 5.75                                      | 5.75                                      |
| <b>Alternative 3 (Preferred)</b>      |   |   |
| Rock Springs                          | 224.75                                    | 96.75                                     |
| Bass Flat                             | 5.75                                      | 5.75                                      |
| <b>Macari Fiber Optic Alternative</b> |   |   |
| None                                  |   |   |

\*Includes transmission lines, switching stations, and substation disturbances on public land (if applicable).

The Greenwave Substation would be located on private land and not impact public livestock grazing.

*Indirect Impacts*

Dust created from project construction could indirectly affect forage palatability by coating vegetation in the area adjacent to the Proposed Action. This indirect impact would be localized and temporary.

*Mitigation and Monitoring Measures*

BLM rangeland management specialist and SPPC would coordinate with the permittees to locate range improvements within the Proposed Action and Alternatives areas of disturbance. SPPC would ensure that all temporary road or fence removal creating openings would have barriers across them to prevent the movement of livestock off range. SPPC would repair all damaged or removed range improvements after completion of construction activities.

*Residual Impacts*

No residual impacts are anticipated as a result of the Proposed Action and its mitigation measures.

**Alternative 1***Direct Impacts*

The SPPC Alternative 1 directly impacts two BLM grazing allotments. Alternative 1 directly impacts the Carson Lake and Pasture on Reclamation lands. Direct impacts would be the same as identified under the Proposed Action Alternative.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative 1 and its mitigation measures.

**Alternative 2***Direct Impacts*

The SPPC Alternative 2 directly impacts two BLM grazing allotments. Alternative 2 does not directly impact any pastures on Reclamation lands. Direct impacts would be the same as identified under the Proposed Action Alternative.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative 2 and its mitigation measures.

**Alternative 3 (Preferred)***Direct Impacts*

The SPPC Alternative 3 directly impacts two BLM grazing allotments. Alternative 3 does not indirectly impact any pastures on Reclamation lands. Direct impacts would be the same as identified under the Proposed Action Alternative.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Alternative 2 and its mitigation measures.

**Macari Fiber Optic Alternative***Direct Impacts*

The SPPC Macari Fiber Optic Alternative does not directly impact any BLM grazing allotments or pastures on Reclamation lands.

*Indirect Impacts*

No indirect impacts have been identified.

*Mitigation and Monitoring Measures*

No Mitigation measures would be needed.

*Residual Impacts*

No residual impacts are anticipated as a result of the Macari Fiber Optic Alternative and its mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on grazing acreage and grazing improvements would not occur.

**Ormat Project Area****Proposed Action***Direct Impacts*

The Ormat Proposed Action directly impacts two pastures on Reclamation lands. The Proposed Action does not directly impact any BLM grazing allotments. Any direct impacts would be similar to those identified under the SPPC Proposed Action. Less than one percent of available forage within the Carson Lake and Pasture would be permanently lost to livestock grazing operations under the Proposed Action. Three percent of available forage within Grimes Point Pasture would be permanently lost to livestock grazing operations under the Proposed Action (see **Table 4-16**, Approximate Acreage of Disturbance of Grazing Allotments or Pastures on Public Lands Under the Ormat Proposed Action and Alternative). The loss of permanent forage would not necessitate reduction in AUMs or removal of any cattle.

**Table 4-16**  
**Approximate Acreage of Disturbance of Grazing Allotments or**  
**Pastures on Public Lands Under the Ormat Proposed Action and**  
**Alternative\***

| <b>Allotment/ Pasture</b> | <b>Temporary Disturbance (Acres)</b> | <b>Permanent Disturbance (Acres)</b> |
|---------------------------|--------------------------------------|--------------------------------------|
| <b>Proposed Action</b>    |                                      |                                      |
| Grimes Point              | 105                                  | 61                                   |
| Carson Lake and Pasture   | 147                                  | 92                                   |
| Harmon Pasture            | 0                                    | 0                                    |
| <b>Alternative</b>        |                                      |                                      |
| Grimes Point              | 105                                  | 60                                   |
| Carson Lake and Pasture   | 136                                  | 89                                   |
| Harmon Pasture            | 0                                    | 0                                    |

\*Includes pipeline, well pad, substation, interconnect transmission line, switching station, and power plant disturbances on public land (if applicable)

*Indirect Impacts*

The possible reduction in water quantity due to reduction in groundwater levels or pressures in springs or seasonal wetlands (see Section 4.7) could affect livestock grazing on the Rock Springs Allotment, causing a greater concentration of cattle in other areas.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under indirect impacts. Alternative I

**Alternative (Preferred)**

*Direct Impacts*

The Ormat Alternative directly impacts two pastures on Reclamation lands. Direct impacts would be the same as identified under the Proposed Action Alternative.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action Alternative.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Ormat's Alternative and its mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on grazing acreage and grazing improvements would not occur.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

The Vulcan Proposed Action directly impacts two BLM grazing allotments and one pasture on Reclamation lands (see **Table 4-17**, Approximate Acreage of Disturbance of Grazing Allotments or Pastures on Public Lands Under the Vulcan Proposed Action and Alternative). Direct impacts would be similar to those identified under the SPPC Proposed Action. Rock Springs Grazing Allotment would permanently lose 1.2 percent of forage under the Proposed Action. Less than one percent of forage would be permanently lost within the Bass Flat Grazing Allotment and the Carson Lake and Pasture under the Proposed Action. This permanent loss of forage would not necessitate a reduction of AUMs or removal of cattle.

**Table 4-17**  
**Approximate Acreage of Disturbance of Grazing Allotments or**  
**Pastures on Public Lands Under the Vulcan Proposed Action and**  
**Alternative**

| <b>Allotment/ Pasture</b> | <b>Temporary<br/>Disturbance (Acres)</b> | <b>Permanent<br/>Disturbance (Acres)</b> |
|---------------------------|--|--|
| <b>Proposed Action</b>    |  |  |
| Rock Springs              | 892                                      | 518                                      |
| Bass Flat                 | 93                                       | 59                                       |
| Carson Lake and Pasture   | 113                                      | 61                                       |
| <b>Alternative</b>        |  |  |
| Rock Springs              | 892                                      | 518                                      |
| Bass Flat                 | 271                                      | 136                                      |
| Carson Lake and Pasture   | 112.6                                    | 60.6                                     |

\*Includes pipeline, well pad, substation, interconnect transmission line, switching station, and power plant disturbances on public land (if applicable).

*Indirect Impacts*

Indirect impacts would be the same as identified under the Ormat Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the SPPC Proposed Action.

*Residual Impacts*

Residual impacts would be the same as identified under indirect impacts.

**Alternative I***Direct Impacts*

The Vulcan Alternative I directly impacts two BLM grazing allotments and one pasture on Reclamation lands. Direct impacts would be the same as identified under the Proposed Action Alternative.

*Indirect Impacts*

Indirect impacts would be the same as identified under the Proposed Action Alternative.

*Mitigation and Monitoring Measures*

Mitigation measures would be the same as identified under the Proposed Action.

*Residual Impacts*

No residual impacts are anticipated as a result of Vulcan's proposed Alternative and its mitigation measures.

**No Action Alternative**

Under the No Action Alternative, temporary and permanent impacts on grazing acreage and grazing improvements would not occur.

**4.19 RECREATION****Summary****Assessment Methodology**

Recreation uses and access were discussed in **Section 3.19, Recreation**. The analysis of potential impacts was based on the recreational use within and adjacent to the Salt Wells Energy Projects Area and existing access routes.

**Indicators**

Impacts on recreation use and access caused by the Proposed Actions or Alternatives were evaluated by determining the potential for:

- Changes in access to, or visitor satisfaction with, existing recreation areas or sites, or
- Modifications to existing routes of travel or courses for motorized recreational users.

***Region of Influence***

The ROI for impacts on recreation is the Salt Wells Energy Projects Area.

**SPPC Project Area*****Proposed Action***

The SPPC Proposed Action facilities would be located primarily on private land and along existing easements and ROWs. The portion of the SPPC Project that includes the 230-kV transmission line from the Macari Switching Station to the Pony Express Switching Station would be constructed on lands administered by Reclamation and the BLM. In addition, SPPC proposes construction of the Pony Express and the Bass Flat Switching Stations on lands administered by the BLM. Existing access roads would be used for construction of the transmission line and switching stations to the extent feasible. Temporary centerline and spur roads would be constructed for use during construction of the transmission line. After construction has been completed all temporary access and spur roads would be recontoured, decompacted, and seeded. SPPC would attempt to close or restrict vehicle access to areas that have been reclaimed and seeded until the reclamation success criteria, which would be developed as part of the reclamation plan included in the POD, have been achieved.

***Direct Impacts***

During construction of the transmission line, temporary access and centerline roads would be constructed and could result in increased OHV use of the areas until the roads are reclaimed. Construction could also result in temporary access restrictions for recreational users on the Reclamation- or BLM-administered lands; however, these impacts would be localized and temporary. The current VORRA race route runs parallel to a portion of the proposed SPPC Project Area along Salt Wells Road, less than 0.5 mile to the east of the transmission line corridor and then cross the transmission line corridor approximately 3 miles northwest of the proposed Pony Express Switching Station location. The route then follows the gas pipeline road adjacent to the proposed Bass Flat Switching Station. The exact locations of the proposed transmission line poles are not known; however, there could be conflicts with the VORRA race route if the poles are located within or adjacent to the route, potentially creating a safety hazard. Construction could also result in temporary access restrictions to the VORRA race route. Although the Vegas-to-Reno race route runs parallel to the proposed Bass Flat Switching Station site, the site is surrounded by existing facilities including the Austin to Fort Churchill 230-kV transmission line. No impacts on the race or the route are anticipated.

The SPPC Proposed Action route would not result in direct impacts on recreation at the Pony Express Trail, Grimes Point Archaeological Site, or Hidden Cave due to the distance from these areas. The Proposed Action route is not near the Carson Lake and Pasture and would not result in modifications to access in that area; therefore, there would be no direct impacts on hunting or wildlife viewing from the Proposed Action.

#### *Indirect Impacts*

Visual impacts from the transmission line could have indirect impacts on recreation at Grimes Point Archaeological Site and Hidden Cave. Visual impacts associated with the Proposed Action are discussed in **Section 4.17**. Noise emitted by the 230-kV transmission line and Bass Flat Switching Station may also have indirect impacts on recreation in the area. Noise impacts are discussed in detail in **Section 4.21**.

#### *Mitigation and Monitoring Measures*

Potential safety hazards for the VORRA race route would be mitigated by working with the race coordinators and locating power poles a safe distance from the race route where feasible. Use or construction conflicts with the race would be mitigated by timing the transmission line construction to avoid the annual VORRA race. Revegetation measures would be outlined in the POD and would be implemented to reclaim temporary roads (see Section 4.9).

#### *Residual Impacts*

No residual impacts would remain after the described mitigation measures are implemented. If revegetation of temporary roads was not successful, this would cause a residual impact (see Section 4.9).

### **Alternative I**

#### *Direct Impacts*

Impacts under Alternative I are the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts from Alternative I would be the same as the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as the Proposed Action.

#### *Residual Impacts*

No residual impacts would remain after the spur and centerline roads are reclaimed and mitigation measures are implemented.

### **Alternative 2**

#### *Direct Impacts*

Impacts under Alternative 2 are the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts from Alternative 2 would be the same as the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for Alternative 2 would be the same as the Proposed Action.

#### *Residual Impacts*

No residual impacts would remain after the spur and centerline roads are reclaimed and mitigation measures are implemented.

### **Alternative 3 (Preferred)**

#### *Direct Impacts*

Impacts under Alternative 3 are the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts from Alternative 3 would be the same as the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for Alternative 3 would be the same as the Proposed Action.

#### *Residual Impacts*

No residual impacts would remain after the spur and centerline roads are reclaimed and mitigation measures are implemented.

### **Macari Fiber Optic Alternative**

#### *Direct Impacts*

Impacts under the Macari Fiber Optic Alternative are the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts from the Macari Fiber Optic Alternative would be the same as the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation measures for the Macari Fiber Optic Alternative would be the same as the Proposed Action.

*Residual Impacts*

No residual impacts would remain after the spur and centerline roads are reclaimed and mitigation measures are implemented.

**No Action Alternative**

Under the No Action Alternative, no changes to the existing recreation levels or uses would occur. No new access roads would be constructed; and no temporary access restrictions would result.

**Ormat Project Area****Proposed Action**

As discussed in **Section 3.19**, there are no OHV race routes within the Ormat Project Area but the Project Area is adjacent to the Carson Lake and Pasture and Grimes Point Archaeological Site.

*Direct Impacts*

During construction of the wells pads and pipelines, temporary access and spur roads would be constructed and could result in increased OHV use of the areas until the roads are reclaimed. Construction could also result in temporary access restrictions for recreational users on the Reclamation or BLM-administered lands; however, these impacts would be localized and temporary. Pipeline roads would be constructed for use during construction and maintenance of the pipelines. These roads would not modify or restrict current access to the Carson Lake and Pasture area; therefore there would be no permanent impacts on hunting or wildlife viewing in this area.

*Indirect Impacts*

The Proposed Action could result in indirect impacts on recreation at Grimes Point Archaeological Site due to visual and noise impacts during construction; however, the construction impacts would be temporary. Visual impacts from the power plant are addressed in **Section 4.17**. Noise impacts associated with the Proposed Action are discussed in **Section 4.21**.

*Mitigation and Monitoring Measures*

Construction of the wells and pipelines on the eastern boundary of the Carson Lake and Pasture resulting in access restrictions for the public would be timed to avoid the peak hunting and wildlife viewing seasons, as outlined in the POU, to minimize impacts on hunting and wildlife viewing activities in that area. Revegetation measures would be outlined in the POU and implemented to reclaim temporary roads (see Section 4.9).

*Residual Impacts*

No residual impacts would remain after temporary access roads are reclaimed and mitigation measures are implemented. If revegetation of temporary roads were not successful, this would cause a residual impact (see Section 4.9).

**Alternative I (Preferred)***Direct Impacts*

Impacts under Alternative I are the same as those described under the Proposed Action.

*Indirect Impacts*

Indirect impacts from Alternative I would be the same as the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would be the same as the Proposed Action.

*Residual Impacts*

No residual impacts would remain after temporary access roads are reclaimed and mitigation measures are implemented.

**No Action Alternative**

Under the No Action Alternative, no changes to the existing recreation levels or uses would occur. No new access roads would be constructed and no temporary access restrictions would result.

**Vulcan Project Area****Proposed Action (Preferred)**

As discussed in **Section 3.19**, there are OHV race routes that traverse the southern and eastern portions of the Vulcan Project Area. In addition, the Project Area is adjacent to the Carson Lake and Pasture and near the Pony Express National Historic Trail.

*Direct Impacts*

During construction of the well pads and pipelines, temporary access and spur roads would be constructed and could result in increased OHV use of the areas until the roads are reclaimed. Construction could also result in temporary access restrictions for recreational users; however, these impacts would be localized and temporary. Pipeline roads would be constructed for use during construction and maintenance of the pipelines. These roads would not modify or restrict current access to the Carson Lake and Pasture area; therefore there would be no permanent impacts on hunting or wildlife viewing in this area.

The current VORRA race route crosses the Vulcan Project Area just east of proposed Power Plant Site I and well pad 24. As currently proposed the Vulcan pipeline route would cross the VORRA race route at Salt Wells Road and again to the west as the trail turns back to the south. The SPPC Proposed Action route would not result in direct impacts on recreation at the Pony Express National Historic Trail, Grimes Point Archaeological Site, or Hidden Cave due to the distance from these areas. The Proposed Action route is not near the

Carson Lake and Pasture and would not result in modifications to access in that area; therefore, there would be no direct impacts on hunting or wildlife viewing from the Proposed Action.

#### *Indirect Impacts*

Visual impacts from a power plant at Power Plant Site 5 could have indirect impacts on recreational use of the Pony Express National Historic Trail. The Proposed Action could also result in indirect impacts on recreation due to visual and noise impacts during construction; however, the construction impacts would be temporary. Visual impacts from the power plant are addressed in **Section 4.17**. Noise impacts associated with the Proposed Action are discussed in **Section 4.21**.

#### *Mitigation and Monitoring Measures*

Construction of the wells and pipelines on the eastern boundary of the Carson Lake and Pasture resulting in access restrictions for the public would be timed to avoid the peak hours for hunting during the hunting season.

Potential use conflicts and safety hazards for the VORRA race route would be mitigated by coordinating with BLM to locate project facilities a safe distance from the race route where feasible. If necessary the VORRA route may be modified to avoid project facilities as was done to address safety concerns for the ENEL Geothermal Power Plant. In other areas, use or construction conflicts with the race would be mitigated by timing the transmission line construction to avoid the annual VORRA race.

Revegetation measures would be outlined in the POU/POD and implemented to reclaim temporary roads (see Section 4.9).

#### *Residual Impacts*

No residual impacts would remain after the described mitigation measures are implemented. If revegetation of temporary roads were not successful, this would cause a residual impact (see Section 4.9).

#### ***Alternative I***

The VORRA race route runs along most of Vulcan's Alternative 230-kV corridor. In addition, the Vegas to Reno race route runs parallel to the existing Austin to Fort Churchill 230-kV transmission line and the Bass Flat Switching Station site.

#### *Direct Impacts*

Impacts under Alternative I would include those described for the Proposed Action. In addition, since the exact locations of the power poles are not known, there could be conflicts with the VORRA race route. If the poles are located within or adjacent to the route, this could create a safety hazard. Construction could also result in temporary access restrictions to the VORRA race route. Although the Vegas to Reno race route runs parallel to the proposed Bass Flat

Switching Station site, the site is surrounded by existing facilities including the Austin to Fort Churchill 230-kV transmission line, and no impacts on the race or the route are anticipated.

#### *Indirect Impacts*

Indirect impacts under Alternative I would include those described for the Proposed Action. However, additional impacts on recreation could result from noise emitted by the 230-kV transmission line and Bass Flat Switching Station. Noise impacts are discussed in detail in **Section 4.21**.

#### *Mitigation and Monitoring Measures*

Mitigation measures for Alternative I would include those outlined under the Proposed Action as well as additional measures. Potential safety hazards for the VORRA race route would be mitigated by locating power poles a safe distance from the race route as determined by the BLM and outlined in the POU/POD. Use or construction conflicts with the race would be mitigated by timing the transmission line construction to avoid the annual VORRA race.

#### *Residual Impacts*

No residual impacts would remain after temporary access roads are reclaimed and mitigation measures are implemented.

#### **No Action Alternative**

Under the No Action Alternative, no changes to the existing recreation levels or uses would occur. No new access roads would be constructed and no temporary access restrictions would result.

## **4.20 NATIONAL SCENIC AND HISTORIC TRAILS**

### **Summary**

#### ***Assessment Methodology***

The locations of the trails were determined based on National Park Service Geographical Information System data and USGS topographic maps for the area and are shown on Figure 3-21. As discussed in Section 3.21, the Pony Express National Historic Trail is located near and within the Salt Wells Energy Projects Area and several proposed project components cross the trail. Potential impacts on the viewshed for the trails are evaluated in the visual resources Section 4.17. Potential impacts on the historical and cultural aspects of the trail are evaluated in Section 4.14.

#### ***Indicators***

Indicators used to evaluate the potential impacts on National Scenic and Historic Trails include the following:

- Conflict with management goals and objectives set forth by the agency or agencies responsible for trail-wide management and by

the BLM or National Park Service with on-site jurisdiction in order to sustain these resources and their visual or historic qualities;

- Result in proposed uses that are incompatible with maintaining and identifying National Scenic and Historic Trails and their qualities within and adjacent to their boundaries;
- Utilize all or any portion of a National Scenic and Historic Trail during any phase of project activities; or
- Install facilities or transmission lines within a National Scenic and Historic Trail's historic landscape.

### ***Region of Influence***

The ROI for National Scenic and Historic Trails is the Salt Wells Energy Projects Area.

## **SPPC Project Area**

### ***Proposed Action***

#### *Direct Impacts*

The SPPC Proposed Action route crosses the Pony Express National Historic Trail. The Pony Express Switching Station and preferred transmission line corridor is crossed by the Pony Express National Historic Trail adjacent to the existing ENEL Geothermal Power Plant (Figure 3-21, Cultural and Visual Resources). Few additional impacts on the viewshed of the Pony Express National Historic Trail would occur. However, the Proposed Action would have direct effects on National Scenic and Historic Trails.

#### *Indirect Impacts*

The Pony Express and Bass Flat Switching Stations would be visible from a portion of the Pony Express National Historic Trail, although due to their small size, location adjacent to the existing ENEL Geothermal Power Plant, and distance from the trail, viewshed impacts are minimal (see **Section 4.17**, Visual Resources).

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures are needed for the SPPC Proposed Action to reduce impacts on National Scenic and Historic Trails.

#### *Residual Impacts*

Residual impacts on National Scenic and Historic Trails are anticipated from the SPPC Proposed Action.

### ***Alternative 1***

#### *Direct Impacts*

Impacts on National Scenic and Historic Trails under Alternative 1 would be the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts on National Scenic and Historic Trails under Alternative 1 would be the same as those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed for Alternative 1 to reduce impacts on National Scenic and Historic Trails.

#### *Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from Alternative 1.

### ***Alternative 2***

#### *Direct Impacts*

Impacts on National Scenic and Historic Trails under Alternative 2 would be the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts on National Scenic and Historic Trails under Alternative 2 would be the same as those described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed for Alternative 2 to reduce impacts on National Scenic and Historic Trails.

#### *Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from Alternative 2.

### ***Alternative 3 (Preferred)***

#### *Direct Impacts*

Impacts on National Scenic and Historic Trails under Alternative 3 would be the same as those described for the Proposed Action

#### *Indirect Impacts*

Indirect impacts on National Scenic and Historic Trails under Alternative 3 would be the same as those described for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed for Alternative 3 to reduce impacts on National Scenic and Historic Trails.

*Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from Alternative 3.

**Macari Fiber Optic Alternative***Direct Impacts*

As described for the Proposed Action, direct impacts are not anticipated under the Macari Fiber Optic Alternative.

*Indirect Impacts*

Due to its distance from the Pony Express National Historic Trail, indirect impacts on National Scenic and Historic Trails are not anticipated from the Macari Fiber Optic Alternative.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would not be necessary for the Macari Fiber Optic Alternative.

*Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from the Macari Fiber Optic Alternative.

**No Action Alternative**

The No Action Alternative would have no impacts on National Scenic and Historic Trails.

**Ormat Project Area****Proposed Action***Direct Impacts*

The Ormat Proposed Action would not directly cross any National Scenic and Historic Trails, including the Pony Express National Historic Trail. As such, the Proposed Action would not have any direct effects on National Scenic and Historic Trails.

*Indirect Impacts*

Due to its distance from the Pony Express National Historic Trail, the Ormat Proposed Action is not anticipated to have indirect effects on National Scenic and Historic Trails.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed for the Ormat Proposed Action to reduce impacts on National Scenic and Historic Trails.

*Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from the Ormat Proposed Action.

**Alternative I (Preferred)***Direct Impacts*

Alternative I would not directly cross any National Scenic and Historic Trails, including the Pony Express National Historic Trail. As such, the Proposed Action would not have any direct effects on National Scenic and Historic Trails.

*Indirect Impacts*

Due to its distance from the Pony Express National Historic Trail, Alternative I is not anticipated to have indirect effects on National Scenic and Historic Trails.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures are not needed for Alternative I to reduce impacts on National Scenic and Historic Trails.

*Residual Impacts*

Residual impacts on National Scenic and Historic Trails are not anticipated from Alternative I.

**No Action Alternative**

Under the No Action Alternative, no impacts on National Scenic and Historic Trails would occur.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

The Vulcan Proposed Action would not directly cross any National Scenic and Historic Trails, including the Pony Express National Historic Trail. As such, the Proposed Action would not have any direct effects on National Scenic and Historic Trails.

*Indirect Impacts*

Proposed power plant at Power Plant Site 5, as well as associated structures, would be visible from a portion of the Pony Express National Historic Trail. This could have visual impacts on the historic landscape, as described in **Section 4.17**, Visual Resources. However, in accordance with the 2006 Memorandum of Understanding, which calls for viewshed protection for

National Scenic and Historic Trails, the land managers have responsibility for resources and viewshed protection and would consider impacts and mitigation for the Proposed Action.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures described in **Section 4.17**, Visual Resources, would be implemented to reduce indirect visual impacts on the Pony Express National Historic Trail.

*Residual Impacts*

Residual visual impacts would occur for the Vulcan Project, since Power Plant Site 5 would remain visible from a portion of the Pony Express National Historic Trail.

**Alternative I**

*Direct Impacts*

Alternative I includes the transmission line extension, which would cross the Pony Express National Historic Trail. Construction of the transmission line would increase noise and human presence in this otherwise remote and noiseless area, causing temporary potential impacts on visitor satisfaction for trail users near the construction site. Visitors, as well as special events, such as the Pony Express National Historic Trail re-ride, would not be able to use a portion of the trail during construction activities, which would impact visitor satisfaction and conflict with the 2006 MOU, which includes provision of appropriate access. However, Alternative I would not permanently preclude use of the Pony Express National Historic Trail.

Construction would disturb surface soils, which would potentially destroy evidence of surface features associated with the trail over time, causing impacts on cultural resources, as described in **Section 4.14**, Cultural Resources.

*Indirect Impacts*

Operation of the transmission line, Power Plant Site 5, and associated facilities would have permanent visual impacts, described in **Section 4.17**, Visual Resources. The transmission line would cross the trail and would be visible along a portion of the trail to the north and south for several miles. This would be in conflict with the 2006 Memorandum of Understanding, which calls for viewshed protection for National Scenic and Historic Trails.

*Mitigation and Monitoring Measures*

To mitigate for the potential impacts on visitor satisfaction, the proposed project would not be constructed during the timeframe when the Pony Express National Historic Trail re-ride occurs. This usually occurs over a two week period in June, although project proponents would coordinate with the organizers of the event to determine the exact dates and to completely avoid impacting this event.

Mitigation and monitoring measures described in **Section 4.17**, Visual Resources, would be implemented to reduce indirect visual impacts on the Pony Express National Historic Trail.

*Residual Impacts*

Residual visual impacts would occur for Alternative I, since the transmission line and Power Plant Site 5 would remain visible from a portion of the Pony Express National Historic Trail.

**No Action Alternative**

Under the No Action Alternative, no impacts on National Scenic and Historic Trails would occur.

## **4.21 NOISE**

### **Summary**

**Assessment Methodology**

For this analysis, application of the EPA noise control ordinance guidelines were used as a guide for assessing impacts at the nearest home, ranch, business, or identified receptor, and all identified sensitive receptors. Each phase of the project is also described in terms of expected noise impacts on recreational users in the proximity of the Project Area.

For the purposes of the noise impact analysis, the following qualitative terms describe the potential impact levels associated with the Alternatives:

*Major* – Noise impacts in residential areas would exceed the thresholds set for residential areas in the commonly implemented version of the EPA Model Community Noise Control Ordinance of:

- 75 dBA Ldn instantaneously
- 65 dBA for 15 minute average
- 55 dBA Ldn for one hour or 24 hour average

*Moderate* – Noise impact would represent a noticeable increase over background levels that could approach but not reach the major noise impact threshold.

*Minor* – Noise impacts could be higher than current background noise levels, but would not approach the major noise impact thresholds on any timeframe.

*Negligible* – Noise impacts would be at or lower than background noise levels and therefore indistinguishable from typical background noise.

**Construction**

For all project-related construction activity, the nearest sensitive receptor is identified, and impacts on that and other potential receptors have been assessed.

The duration of construction activity at any particular site is generally expected to be brief, measured in weeks to months, except in staging areas and at the power plant sites. Along the linear construction lines, a qualitative assessment of impact to sensitive receptors and duration of that impact was completed.

The unit of sound level measurement (i.e., volume) is the dB, expressed as dBA. The A-weighted decibel measure is used to evaluate ambient noise levels and common noise sources. Sound measurements in dBA give greater emphasis to sound at the mid- and high- frequency levels, which are more discernible to humans. The decibel is a logarithmic measurement; thus, the sound energy increases by a factor of 10 for every 10 dBA increase. A 3 dBA change in noise levels is considered barely perceptible, while a 5 dBA change is typically perceptible to most people. Noise level attenuates by 6 dBA for every double of distance from the source.

Neither Nevada nor Churchill County has regulations quantitatively limiting noise generation or impacts from the proposed projects during the construction phase. The EPA has prepared a Model Community Noise Control Ordinance to provide guidance for local communities or jurisdictions to design noise control regulations (EPA undated). One of the more commonly used applications of the EPA noise control guidelines is the recommendation that noise levels should be limited to 55 dBA Ldn for a daily and hourly average, allowing for higher impacts for shorter averaging periods, with a maximum noise impact of 75 dBA Ldn at any time in residential areas.

**Geothermal Operations**

Noise impacts were evaluated for the operational phase of the project using the indicators, but also included a comparison against the BLM-adopted noise restriction for projects on federal leases and against county guidelines.

The USGS Geothermal Resources Operational Order No. 4 states that geothermal-related activities on federal leases would not exceed a noise level of 65 dBA at the lease boundary or at 0.8 kilometers (0.5 miles) from the source, whichever is greatest (USGS 1974).

Churchill County Bill 2010-C, signed in August 2010, introduced Ordinance 32, which made additions to Chapter 16.16, Development Standards, of Title 16, the Consolidated Development Code. The ordinance added regulations for renewable energy facilities as a guideline to the planning and development of future projects within the county. Bill 2010-C includes noise standards that mirror the USGS Geothermal Resources Operational Order No. 4, described above, with the additional exception of tolerating irregular, short periods of

exceedance in association with anomalies or maintenance. The bill acknowledges that shielding may be required for wellheads and equipment in order to comply with the standard.

Noise from power plants was evaluated using noise data from existing geothermal power plants that employ similar technologies.

#### ***Indicators***

The primary indicator of noise levels for this and similar analyses is the A-weighted average noise level measured in decibels (LAeq). The one-hour average noise level (dBA LAeq (1 hour)) is often used to characterize ongoing operations or longer-term impact analyses. The maximum dBA level (dBA Lmax) is used to document the highest intensity, temporary noise level. Another commonly used measure of noise impacts is Ldn. The Ldn value matches the LAeq value for noise generated from 7 a.m. to 10 p.m., but accounts for increased public sensitivity to noise at night by the A-weighted equivalent sound level for a 24-hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 a.m.

#### ***Region of Influence***

The ROI for the noise analysis is one mile from all project activities.

### **SPPC Project Area**

#### ***Proposed Action***

##### ***Direct Impacts***

The construction and maintenance of the transmission lines and substations would involve noise-making activities from blasting and equipment used for drilling, earth moving, and hauling. This would occur along the transmission routes, along ROWs, in staging areas, at switching stations, and at the Greenwave Substation.

The exact layout and boundaries of the Greenwave Substation is still under consideration pending acquisition of properties by SPPC in the area to the southeast of the intersection of Scheckler Road and Allen Road. Seven residences, one school, and one church are located within 500 feet of the proposed Greenwave Substation. Some of the sensitive receptors may be bought out by SPPC to clear the land and build the substation; any such properties would be razed and would no longer be by the site of sensitive receptors. The Greenwave Substation would be constructed over approximately 6 to 9 months, depending on weather and worker availability.

The peak construction period for the transmission line is expected to last about 15 months. Because of the linear nature of the transmission line portion of the project, workers, noise-making activities, and equipment are not expected to be

in one place for a long period of time. Also, noise from blasting would be limited in frequency and would be temporary (less than half a second).

To minimize impacts on ambient noise levels when near noise-sensitive receptors, SPPC's standard work procedures include limiting activities producing noise to Monday through Saturday from 7 a.m. to 5 p.m. Otherwise, work may occur for 12-hours per day on every day of the week. The specified hours of construction and maintenance would not apply to driving on access roads or work that does not substantially exceed exterior ambient noise levels. Construction equipment would be equipped with manufacturer-recommended (or other appropriate) mufflers. As a result, construction of the Greenwave Substation would involve minor temporary noise impacts on nearby receptors for the duration of the 6 to 9 month construction period. There would also be minor temporary impacts on ambient noise levels during construction of transmission line routes adjacent to and through populated areas.

Operation of the SPPC project components would result in noise from the transmission lines and towers, noise from activities for routine inspection and maintenance of the new facilities, and noise from the switching station and substation facilities. Noise from routine maintenance is considered to be low, intermittent, and would not represent an impact to any sensitive receptors.

Noise generated by the Greenwave Substation may affect residences, a school, and a church that are located nearby. The transformers within substations emit low frequency noise (120 hertz) that is heard as a humming sound, which results from vibrations caused by expansion and contraction of the transformer core. Whether such noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures). Transformers may be as close as 150 feet to the fence line of the substation.

Residents of properties near the substation could be impacted by operational noise of the transformers. The layout of the substation and the noise impacts on nearby residences would be addressed during the Churchill County permitting process for the facility. SPPC would file a permit application for siting the Greenwave Substation, which would involve an open, public forum. Residents with properties adjoining the substation would be notified and invited to provide comment to the Planning Commission.

Transmission line noise includes corona, insulator, and eolian noise.

"Corona" noise is the most common noise generated by transmission lines. Corona is the electrical ionization of air near the surface of the conductor and suspension hardware from the high electric field strength. This type of noise varies with both weather and voltage of the transmission line, and most often occurs in conditions of heavy rain and high humidity (typically greater than 80

percent). An electric field surrounds power lines and causes implosion of ionized water droplets in the air, which produces the sound.

During relatively dry conditions, corona noise typically results in continuous noise levels of 40 to 50 dBA in close proximity to the transmission line, such as at the edge of the right-of-way. During wet or high humidity conditions, corona noise levels typically increase to levels of 50 to 60 dBA and possibly higher. Corona noise levels vary from location to location due to differences in conductor surface defects, damage, dust, and other factors. Due to the dry climate and lack of humidity in the high desert climate of the SPPC Project Area, elevated noise from corona is only expected during and following precipitation events, and to a lesser extent, following irrigation of any agricultural fields that underlie the transmission line. Due to the limited precipitation experienced in the Project Area, the lack of sensitive receptors direction adjacent to the transmission line ROW and the overall elevated background noise levels due to NAS Fallon overflights, impacts from corona noise are expected to be negligible.

The newer polymer insulators that are used today minimize this type of noise. Due to the use of polymer insulators, the lack of sensitive receptors directly adjacent to the transmission line ROW and the overall elevated background noise levels due to NAS Fallon overflights, impacts from insulator noise are expected to be negligible.

Eolian noise is the sound of wind blowing through conductors and frames. This type of noise is generally infrequent and varies with wind velocity and direction. Wind must blow steadily and perpendicular to the lines to set up an eolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the transmission line. High winds are common in the Project Area so eolian noise could potentially occur under appropriate conditions. High winds result in elevated noise conditions and naturally raise the ambient noise level.

Corona and eolian noise may be generated along the length of the transmission line route and could be audible at sensitive receptors directly adjacent to the ROW. Corona noise are typically not audible beyond the transmission line ROW and would therefore not be expected to affect any sensitive receptors; however, the Proposed Action does have 20 sensitive receptors located within 500 feet of the Greenwave Substation and transmission line ROW.

Eolian noise would be produced only during periods of high winds, which themselves produce higher levels of ambient noise. Twenty sensitive receptors are located within 500 feet of the Greenwave Substation and transmission line and may be affected by eolian noise during periods of high winds. Eolian noise is expected to be infrequent and quieter than the NAS Fallon overflights.

*Indirect Impacts*

No indirect noise impacts have been identified in relation to the Proposed Action.

*Mitigation and Monitoring Measures*

Since the exact location of the Greenwave Substation within the land parcel is not yet known, only general mitigation measures are proposed at the time of this writing. SPPC would do the following to reduce noise impacts:

- SPPC would meet the EPA noise threshold level of 55 dBA at the property line.

Additional measures to reduce noise may be considered by SPPC through the Churchill County permit application process, and may include:

- Planning the substation layout such that the noise-generating components are set back from sensitive receptors;
- Installation of a wall constructed of materials such as cinder blocks, which may reduce sound levels.

*Residual Impacts*

After mitigation, construction activities for the Greenwave Substation and the transmission line would still be audible at nearby sensitive receptors within the hours of 7 a.m. to 5 p.m. for the duration of those construction activities. Depending on final design and noise mitigation implemented through the Churchill County planning process, operation of the substation may or may not be audible from nearby sensitive receptors.

***Alternative I****Direct Impacts*

Impacts from the Greenwave Substation would be as described under the Proposed Action. Potential impacts of transmission line operational noise are as described under the Proposed Action but could affect the additional 19 residences that were identified within 500 feet of the proposed transmission line.

*Indirect Impacts*

No indirect noise impacts have been identified in relation to Alternative I.

*Mitigation and Monitoring Measures*

Mitigation measures are as described under the Proposed Action.

*Residual Impacts*

Residual impacts for construction activities at the Greenwave Substation and the transmission line would be as described under the Proposed Action, with

additional residual impacts potentially occurring at 19 additional residences identified in close proximity to the transmission line ROW.

### **Alternative 2**

#### *Direct Impacts*

Impacts from the Greenwave Substation would be as described under the Proposed Action. Potential impacts of transmission line operational noise are as described under the Proposed Action but could affect one additional residence that was identified within 500 feet of the proposed transmission line.

#### *Indirect Impacts*

No indirect noise impacts have been identified in relation to Alternative 2.

#### *Mitigation and Monitoring Measures*

Mitigation measures are as described under the Proposed Action.

#### *Residual Impacts*

Residual impacts for construction activities at the Greenwave Substation and the transmission line would be as described under the Proposed Action, with additional residual impacts potentially occurring at one additional residence that may occur in close proximity to the transmission line ROW.

### **Alternative 3 (Preferred)**

#### *Direct Impacts*

Impacts from the Greenwave Substation would be as described under the Proposed Action. Potential impacts of transmission line operational noise are as described under the Proposed Action but could affect one additional residence that was identified within 500 feet of the proposed transmission line.

#### *Indirect Impacts*

No indirect noise impacts have been identified in relation to Alternative 3.

#### *Mitigation and Monitoring Measures*

Mitigation measures are as described under the Proposed Action.

#### *Residual Impacts*

Residual impacts for construction activities at the Greenwave Substation and the transmission line would be as described under the Proposed Action, with additional residual impacts potentially occurring at one additional residence that may occur in close proximity to the transmission line ROW.

**Macari Fiber Optic Alternative***Direct Impacts*

The Macari Fiber Optic Alternative would involve the installation of the fiber optic cable along a route that would come within 0.37 miles (2,000 feet) east of the nearest sensitive receptor, a residence along Macari Road. At this distance, there would be no noise impacts on this or any other sensitive receptor.

*Indirect Impacts*

No indirect noise impacts have been identified in relation to the Macari Fiber Optic Alternative.

*Mitigation and Monitoring Measures*

No mitigation measures were identified for the Macari Fiber Optic Alternative.

*Residual Impacts*

No residual impacts were identified for the Macari Fiber Optic Alternative.

**No Action Alternative**

No noise impacts were identified for the No Action Alternative.

**Ormat Project Area****Proposed Action***Direct Impacts*

Expected sources of noise associated with the Proposed Action include construction activities (earth-moving equipment for road, well pad, and sump pit construction), drilling operations, well testing, and power plant operation.

The only sensitive receptor potentially impacted by the Ormat proposed project would be the home located on Macari Road, 0.35 mile (1,850 feet) west of the Ormat 80 acre parcel, 0.49 mile (2,590 feet) from the proposed power plant, and 0.40 mile (2,100 feet) from the nearest proposed well pad. This section estimates the noise levels at the residence from all noise-generating activities associated with the proposed project.

Noise modeling was conducted based on existing noise data from geothermal operations at other locations. **Table 4-18**, Project Noise Contributions at Residence from Project Phases, shows the distance of the residence from each of the well pads and the estimated noise at the residence from each phase of the Proposed Action. Both the LAeq and the estimated noise range are provided in dBA.

Noise would be generated during all phases of project activity and could be audible by people visiting the project area for recreation or other purposes. The

**Table 4-18**  
**Projected Noise Contributions at Residence from Project Phases**

| <b>Project Component</b>      | <b>Distance from Residence (feet)</b> | <b>Estimated Noise at 50 feet (dBA)</b> | <b>Estimated Noise at Residence (dBA)</b> |
|-------------------------------|---------------------------------------|---|---|
| Well pad construction for C-i | 2,100                                 | 70 - 95                                 | 37.5 – 62.5<br>LAeq = 50                  |
| C-i drilling                  | 2,100                                 | 75 - 85                                 | 42.5 – 52.5<br>LAeq = 47.5                |
| Well testing                  | 2,100                                 | 90                                      | 55.7                                      |
| Power Plant Construction      | 2,590                                 | 70 - 95                                 | 35.7 – 60.7<br>LAeq = 48.2                |
| Power Plant Operation         | 2,590                                 | 75 - 85                                 | 40.7 – 50.7<br>LAeq = 45.7                |

Note: LAeq is calculated as the average sound level across the range.

Source: Leitner undated; Engineering Page 2009.

levels of noise at a given distance can be extrapolated from the levels shown in Table 4-18. For example, an individual hiking 0.35 mile from a well pad under construction may experience noise at levels up to 62.5 dBA. Lower noise levels would be experienced at that same distance during well drilling and well testing. Even lower noise levels would be experienced at 0.35 mile from the power plant once construction is complete and the plant is operational.

#### ***Impacts from Road, Well Pad and Power Plant Construction***

Heavy earth-moving equipment is used to prepare roads, drill pads, and sumps. Sound pressure levels for these activities have been measured in the range of 70 to 95 dBA at a distance of 50 feet (Leitner undated). Average noise levels at the residence would be expected to be around 50 dBA for the construction activities at the nearest well pad (C-i), and 48.2 dBA for construction activities at the power plant. Construction of the well pads would take place consecutively and would take approximately one to two days per pad. Construction of the power plant would take approximately 15 months.

#### ***Impacts from Drilling Activities***

The dominant noise sources associated with exploratory drilling are the large diesel engines that power the rotary rig and mud pumps and the large diesel-driven air compressors. These noise sources are consistent throughout drilling. Additional intermittent noise sources result from the hoisting of drill pipe or casing and the auto-driller. Hoisting during drilling is usually masked (sound-wise) by the air compressors, but the auto drillers are not. The auto-driller generates a loud squeal one, two, or more times throughout each well hole drilling. Drilling occurs 24 hours per day and is planned to continue for 45 to 60 days per well.

Typical sound levels during drilling when mud is used as the circulating medium range from 75 to 85 dBA at 50 feet (Leitner undated). Based on this data, average noise levels at the residence would be approximately 47.5 dBA during drilling of the nearest well, C-i. Drilling of the other wells would result in sound levels at the residence of 41.5 dBA or less.

#### ***Impacts from Well Testing***

The process of flowing geothermal wells to test production capability also generates noise. Noise is made primarily by the diesel generator that powers the down-hole electric pump, with lesser noise emitted from the fluids flowing through the well head and pipeline to the reinjection well. Additional noise may be realized from any additional diesel generator that is required to power a second pump at the injection well. Flow testing occurs 24 hours per day and would be conducted for 30 to 90 days per well.

Data from geothermal exploration in Imperial Valley, California, suggest that sound pressure levels during flow testing can be as high as 90 dBA at 50 feet (Leitner undated). Based on this data, noise levels at the residence would be expected to be as high as 55.7 dBA for the nearest well pad. Other well pads are at least twice the distance as the nearest well pad and so would be expected to result in noise levels at the residence of 50 dBA or lower, since noise levels drop by 6 dBA for every doubling in distance. Because the primary source of noise during flow testing is from the diesel generators, noise levels can be reduced through the use of hospital mufflers.

#### ***Impacts from Power Plant Operation***

Noise from power plant operation was calculated using existing noise data for other geothermal power plants. Cooling towers, which are the main noise source in binary power plants, have been recorded as generating noise in the range of 75 to 85 dBA at a distance of 50 feet. The middle of this range, 80 dBA, was used to calculate an estimated noise level of 45.7 dBA at the residence, although noise levels could be as high as 50.7 dBA.

Noise impacts on local wildlife are discussed in **Section 4.9**.

#### ***Indirect Impacts***

No indirect noise impacts have been identified for the Proposed Action.

#### ***Mitigation and Monitoring Measures***

The BLM would require the project proponent to ensure that mufflers are present on all diesel engines and any other components that can be muffled such that noise emissions are reduced by at least 15 dBA from the original, non-muffled noise level for the equipment.

The BLM would include that well pad construction activities for well C-i be limited to the 7 a.m. to 10 p.m. timeframe.

*Residual Impacts*

After mitigation, there would remain some audible noise during well pad construction, drilling, and flow testing of for well C-i; however, noise levels at the residence from project activities would be lower than noise levels from NAS Fallon jet overflights.

**Alternative I (Preferred)***Direct Impacts*

Noise impacts would be the same as under the Proposed Action.

*Indirect Impacts*

No indirect noise impacts have been identified for Alternative I.

*Mitigation and Monitoring Measures*

Mitigation and monitoring measures would be as described under the Proposed Action.

*Residual Impacts*

Residual noise impacts would be as described under the Proposed Action.

**No Action Alternative**

No noise impacts were identified for the No Action Alternative.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

There are no noise sensitive receptors near the Vulcan Project Area. No direct noise impacts on humans are anticipated. Noise impacts on local wildlife are discussed in **Section 4.9**.

*Indirect Impacts*

No indirect noise impacts have been identified for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures have been identified for the Proposed Action.

*Residual Impacts*

No residual noise impacts have been identified for the Proposed Action.

**Alternative I***Direct Impacts*

Direct noise impacts for Alternative I are as discussed under the Proposed Action.

*Indirect Impacts*

No indirect noise impacts have been identified for Alternative I.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are identified for Alternative I.

*Residual Impacts*

No residual noise impacts have been identified for Alternative I.

**No Action Alternative**

No noise impacts would result from the No Action Alternative.

**4.22 PUBLIC HEALTH AND SAFETY****Summary****Assessment Methodology**

Distances to schools, residences, businesses, and known contaminated sites were evaluated from various project components. Risk scenarios were developed for the points of interface between hazardous substances and the human environment, including direct handling, storage in the proximity of workers, and transportation along public routes.

**Indicators**

The following indicators were considered when analyzing potential impacts on public health and safety:

- Potential exposure to the public through the routine transport, use, or disposal of hazardous materials;
- Potential exposure to the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emission of hazardous emissions or handling of hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school;
- Collocation of a project component with a site included on a list of hazardous materials sites compiled by the federal or state government and, as a result, would create a hazard to the public; and

- Proximity, capacity, and response time of nearby fire, medical, and police services.

### ***Region of Influence***

The ROI for direct and indirect effects for public health and safety includes the biological survey area for each project. This includes the defined project footprint of each project facility, as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

## **SPPC Project Area**

### ***Proposed Action***

#### *Direct Impacts*

EMF Effects. Implementation of the Proposed Action would result in minor increases in extremely low frequency EMF exposure to residents living near the proposed substation and transmission lines. Based on lateral profiles calculated for EMFs of transmission lines for similar projects (BLM 2004; Bonneville Power Administration 2006), it is anticipated that the EMFs for the Proposed Action would be less than the most stringent state standards for transmission line EMFs at the edge of the ROW (there are no federal standards limiting occupational or residential exposure to 60-Hz EMF). For electric fields, the most stringent state standard is 1.0 kV/m (in Montana), and for magnetic fields it is 150 mG (in Florida). The transmission lines proposed for the Proposed Action would meet these state standards.

The magnetic field from substation and switching station equipment is typically low at locations beyond the substation or switching station property due to the placement of the equipment centrally within the station. Magnetic fields from substation equipment act as point sources and attenuate quickly with distance from the equipment. The dominant sources of magnetic fields near a substation or switching station are typically the electrical power lines that enter and exit the substation and switching station, and, as described previously, the transmission lines would have minor impacts involving magnetic fields.

In addition to meeting the most stringent state standards, SPPC, through its Corporate Policy on EMF, (dated October 24, 1994), would be committed to the following measures:

1. Continuation of an active EMF task force to monitor EMF developments, cooperate and support EMF research, and make appropriate recommendations on EMF.
2. Provide customers with available information on EMF and conduct measurements on request.

3. Participate in communication forums and regulatory proceedings to remain current on EMF-related issues.
4. Take reasonable low-cost/no-cost steps, where appropriate, to reduce EMF fields in the design of new and upgraded facilities.
5. Work with employees and union representatives to implement EMF policies and procedures, and provide employees with up-to-date information.

Worker and Site Safety. Use of hazardous materials during project construction, operation, and maintenance would pose potential health and safety hazards to construction and maintenance workers and nearby residents. These impacts would be associated with blasting (if required and approved), use of hazardous substances during construction and maintenance activities, and the potential for spills. However, SPPC would minimize these public health and safety hazards through compliance with existing laws regulating the use, storage, transportation, and disposal of hazardous materials; implementation of comprehensive BMPs, including those listed in **Appendix E**; and the preparation and implementation of the POD, which would address fire, emergency preparedness, and response, blasting, transportation management, flagging, and fencing, and general spill prevention control.

Construction, operation, and maintenance can affect general public safety along the transmission line routes, in staging areas, and at the proposed substation and switching station sites. This would involve, for example, safe passage past construction sites along roadways, fencing around the substation and switching stations to prevent unauthorized access, and proper installation and operation of equipment to prevent electrical shock or fire. These potential impacts would be minor because SPPC would comply with Nevada Department of Transportation roadway work zone safety requirements and ROW permits. SPPC would also comply with the National Electrical Safety Code at project sites.

Guy wires would present a potential collision hazard to OHV riders, bikers or horse riders. However, site safety requirements involve increasing visibility of the guy wires used to anchor the transmission line poles. If guy wires cross over any designated access roads, they would be marked or flagged, or signs would be posted.

#### *Indirect Impacts*

Indirect impacts on public health and safety are not expected from the Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

With implementation of the Environmental Protection Measures in **Appendix E**, as well as plans included in the POD, no residual impacts on public health and safety are expected from the Proposed Action.

**Alternative 1***Direct Impacts*

Direct impacts on public health and safety from Alternative 1 are expected to be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Alternative 1.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

With implementation of the Environmental Protection Measures in **Appendix E**, as well as plans included in the POD, no residual impacts on public health and safety are expected from Alternative 1.

**Alternative 2***Direct Impacts*

Direct impacts on public health and safety from Alternative 2 are expected to be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Alternative 2.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

With implementation of the Environmental Protection Measures in **Appendix E**, as well as plans included in the POD, no residual impacts on public health and safety are expected from Alternative 2.

**Alternative 3 (Preferred)***Direct Impacts*

Direct impacts on public health and safety from Alternative 3 are expected to be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Alternative 3.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

With implementation of the Environmental Protection Measures in **Appendix E**, as well as plans included in the POD, no residual impacts on public health and safety are expected from Alternative 3.

**Macari Fiber Optic Alternative***Direct Impacts*

Direct impacts on public health and safety from the Macari Fiber Optic Alternative are expected to be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from the Macari Fiber Optic Alternative.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

With implementation of the Environmental Protection Measures in **Appendix E**, as well as plans included in the POD, no residual impacts on public health and safety are expected from the Macari Fiber Optic Alternative.

**No Action Alternative**

Under the No Action Alternative, there would be no direct or indirect impacts on public health and safety.

## Ormat Project Area

### **Proposed Action**

#### *Direct Impacts*

Direct impacts on public health and safety for the Ormat Project would be similar to those described for the SPPC Project. However, impacts caused by EMF would be less of a concern for the Ormat Project, as the transmission line is only 200 feet long.

The Ormat Project would have worker health and safety concerns related to drilling and power plant operations. Since the professional drill crews conducting the drilling operations would follow Occupational Safety and Health Act standards and use non-toxic drilling additives, health and safety risks associated with drilling are considered to be minimal. The use of pentane as a working fluid in the power plant is also considered to be a health hazard since pentane can be hazardous via inhalation.

Pentane is also highly flammable and could pose a risk to health and safety of workers in case of an accidental release and ignition. Ormat will maintain its own fire protection system at the plant site and will prepare an Emergency Response Plan that will address procedures and notification requirements for releases of hazardous substances. The Emergency Response Plan will be submitted to the BLM as part of Ormat's final POU.

*Hydrogen sulfide releases from the geothermal fluids pose a health and safety risk since it is toxic if inhaled. Ormat would have a Hydrogen Sulfide Plan to manage these risks that would be submitted to the BLM as part of the final POU.*

*Indirect Impacts*  
Indirect impacts on public health and safety are not expected from Ormat's Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

#### *Residual Impacts*

Residual impacts on public health and safety are not expected from Ormat's Proposed Action.

### **Alternative I (Preferred)**

#### *Direct Impacts*

Direct impacts on public health and safety for Alternative I would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Alternative I.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts on public health and safety are not expected from Alternative I.

**No Action Alternative**

Under the No Action Alternative, there would be no direct or indirect impacts on public health and safety.

**Vulcan Project Area*****Proposed Action (Preferred)****Direct Impacts*

Direct impacts on public health and safety for the Vulcan Project would be similar to those described for the SPPC Project. However, impacts caused by EMF would be less of a concern for the Vulcan Project, as the 230-kV interconnection line, switching station and power plants are not located near residences or developed areas.

The Vulcan Project would have worker health and safety concerns related to drilling and power plant operations. Since the professional drill crews conducting the drilling operations would follow Occupational Safety and Health Act standards and use non-toxic drilling additives, health and safety risks associated with drilling are considered to be minimal.

The use of flammable working fluids in the power plants is a potential health hazard since pentane, isopentane, and butane are all hazardous if inhaled. Additionally, the working fluids are all highly flammable, and could pose a risk to health and safety of workers in case of an accidental release and ignition. Vulcan will maintain its own fire protection system at the plant site and will prepare an Emergency Response Plan that will address procedures and notification requirements for releases of hazardous substances. The Emergency Response Plan will be submitted to the BLM as part of Vulcan's final POU.

Hydrogen sulfide releases from the geothermal fluids pose a health and safety risk since it is toxic if inhaled. Vulcan would have a Hydrogen Sulfide Plan to manage these risks that would be submitted to the BLM as part of the final POU.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Vulcan's Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts on public health and safety are not expected from Vulcan's Proposed Action.

**Alternative I***Direct Impacts*

Direct impacts on public health and safety for Alternative I would be similar to those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts on public health and safety are not expected from Alternative I.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts on public health and safety are not expected from Alternative I.

**No Action Alternative**

Under the No Action Alternative, there would be no direct or indirect impacts on public health and safety.

**4.23 FIRE MANAGEMENT****Summary****Assessment Methodology**

Fire management status of Salt Wells Energy Projects Area lands was acquired from the BLM and fire ignition risk scenarios were developed and evaluated.

**Indicators**

The following indicators were considered when analyzing potential impacts relative to fire management:

- Proximity, capacity, and response time of nearby fire, medical, and police services; and
- Fire risk status of lands potentially ignited by project-related actions.

***Region of Influence***

The ROI for direct and indirect effects for fire management includes the biological survey area for each project. This includes the defined project footprint of each project facility, as well as a minimum 300-foot buffer, in some cases expanded to 500 feet if a facility was not well defined.

**SPPC Project Area*****Proposed Action****Direct Impacts*

Construction, operation, and maintenance of the transmission lines, switching stations, and substation for the Proposed Action could increase the potential for a fire in the SPPC Project Area. Construction and maintenance could start a fire caused by equipment sparks, workers smoking, or ground disturbances that allow nonnative fire-prone vegetation to establish.

An energized transmission line could pose a fire hazard if a conducting object were to come into proximity to the transmission line, resulting in a flashover to ground, or if an energized phase conductor were to fall to the earth and remain in contact with combustible material long enough to ignite it. It is possible that an energized phase conductor could fall to the ground and cause a fire by creating an electrical arc that could ignite combustible material; however, this is a very unlikely event.

*Indirect Impacts*

The construction of access roads would temporarily increase accessibility of public lands to recreationalists, which would indirectly raise the risk of ignition of wildfires from smoking, camping, and other activities on public lands.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

The implementation of the mitigation measures described previously would reduce potential fire-related impacts; however, the increased access to public lands provided through the access roads constructed as part of the project would result in temporary increases in risk of fire due to increased use by the public until the temporary access, spur and centerline roads have been reclaimed.

### **Alternative 1**

#### *Direct Impacts*

Fire impacts under Alternative 1 would be the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts under Alternative 1 would be the same as described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

#### *Residual Impacts*

Residual impacts under Alternative 1 would be the same as described for the Proposed Action.

### **Alternative 2**

#### *Direct Impacts*

Fire impacts under Alternative 2 would be the same as described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts under Alternative 2 would be the same as described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

#### *Residual Impacts*

Residual impacts under Alternative 2 would be the same as described for the Proposed Action.

### **Alternative 3 (Preferred)**

#### *Direct Impacts*

Fire impacts under Alternative 3 would be the same as described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts under Alternative 3 would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts under Alternative 3 would be the same as described for the Proposed Action.

**Macari Fiber Optic Alternative***Direct Impacts*

Fire impacts under the Macari Fiber Optic Alternative would be the same as described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 1 would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts under the Macari Fiber Optic Alternative would be the same as described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no change in the potential for fire within the SPPC Project Area.

**Ormat Project Area****Proposed Action***Direct Impacts*

Construction, operation, and maintenance of the geothermal power plant, substation, switching station, transmission line, well pads, and pipelines could increase the potential for fire in the Ormat Project Area. Possible sources of fire associated with construction and maintenance include equipment sparks, workers smoking, or ground disturbances that allow the establishment of nonnative fire-prone vegetation. In addition, pentane, a flammable working fluid used in the binary power plant, could increase the potential for fire.

*Indirect Impacts*

The construction of access roads would increase accessibility of public lands to recreationalists, which would indirectly raise the risk of ignition of wildfires from smoking, camping, and other activities on public lands.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

The implementation of the Environmental Protection Measures would reduce potential fire-related impacts; however, the permanent increased access to public lands provided through the access roads constructed as part of the project would result in permanent increases in risk of fire due to increased use by the public.

**Alternative I (Preferred)***Direct Impacts*

Fire impacts under Alternative I would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts under Alternative I would be the same as described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no change in the potential for fire within the Ormat Project Area.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

Construction, operation, and maintenance of 4 possible geothermal power plants, substations, a transmission line, well pads, and pipelines could increase the potential for fire in the Vulcan Project Area. Possible sources of fire associated with construction and maintenance include equipment sparks, workers smoking, or ground disturbances that allow the establishment of nonnative fire-prone vegetation. In addition, the flammable working fluid that will be used in the binary power plant, could increase the potential for fire.

*Indirect Impacts*

The construction of access roads would increase accessibility of public lands to recreationalists, which would indirectly raise the risk of ignition of wildfires from smoking, camping, and other activities on public lands.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

The implementation of the Environmental Protection Measures would reduce potential fire-related impacts; however, the permanent increased access to public lands provided through the access roads constructed as part of the project would result in permanent increases in risk of fire due to increased use by the public.

**Alternative I***Direct Impacts*

Fire impacts under Alternative I would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**.

*Residual Impacts*

Residual impacts under Alternative I would be the same as described for the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, there would be no change in the potential for fire at the Vulcan Project Area.

**4.24 WASTES, HAZARDOUS OR SOLID****Summary****Assessment Methodology**

Data was collected from project proponents describing the types and volumes of hazardous and non-hazardous materials expected to be used, stored, and generated per unit time during both construction and operational phases. As available, disposal plans for these materials were also evaluated. Federal and

state databases were checked to determine the presence of any contaminated sites within the Salt Wells Energy Projects Area.

**Indicators**

The following indicators were considered when analyzing potential impacts on resources from hazardous materials and solid waste:

- Acreage, nature, and proximity of existing contaminated sites included on a list of hazardous materials sites compiled by the federal or state government;
- Types of hazardous materials and wastes used during construction;
- Tons or pounds per year of hazardous wastes and by-products generated by project operations;
- Amount and type of hazardous materials transported and stored at the project facilities;
- Location and type of solid or hazardous waste disposal sites/systems; and
- Existing risk assessments of effects of hazardous compounds.

**Region of Influence**

The ROI for direct and indirect effects for hazardous materials includes the SPPC, Ormat, and Vulcan Survey Areas.

**SPPC Project Area****Proposed Action***Direct Impacts*

No hazardous materials were known to be stored within the SPPC Survey Area. Thus the Proposed Action would not expose workers to any preexisting hazardous materials and wastes not associated with the Proposed Action during construction, operation, and maintenance.

Project construction and operation phases would involve hazardous material use. These materials would include, but would not be limited to, drilling additives and mud, diesel fuel, lubricants, solvents, oil, equipment/vehicle emissions, paint, and cleaners. The transport, use, or disposal of such hazardous materials could affect workers, the public, and the environment through accidental spills or emissions.

*Indirect Impacts*

Indirect impacts involving hazardous materials would entail transport and disposal of such materials to off-site locations, which could expose people and lands outside of the SPPC Project Area to hazardous materials.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD.

*Residual Impacts*

No residual impacts have been identified for the Proposed Action.

**Alternative 1***Direct Impacts*

Impacts from hazardous materials under Alternative 1 would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative 1 would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD.

*Residual Impacts*

No residual impacts have been identified for Alternative 1.

**Alternative 2***Direct Impacts*

Impacts from hazardous materials under Alternative 2 would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts would be the same as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD.

*Residual Impacts*

No residual impacts have been identified for Alternative 2.

### **Alternative 3 (Preferred)**

#### *Direct Impacts*

Impacts from hazardous materials under Alternative 3 would be the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts would be the same as described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD.

#### *Residual Impacts*

No residual impacts have been identified for Alternative 3.

### **Macari Fiber Optic Alternative**

#### *Direct Impacts*

Impacts from hazardous materials under the Macari Fiber Optic Alternative would be the same as those described for the Proposed Action.

#### *Indirect Impacts*

Indirect impacts under the Macari Fiber Optic Alternative would be the same as described for the Proposed Action.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD.

#### *Residual Impacts*

No residual impacts have been identified for the Macari Fiber Optic Alternative.

### **No Action Alternative**

Under the No Action Alternative, there would be no impacts from hazardous materials.

## Ormat Project Area

### ***Proposed Action***

#### *Direct Impacts*

The proposed power plant, substation, pipelines, wells, transmission lines, and access roads would be primarily on undeveloped land where no hazardous materials occur, so the project would not expose workers to any preexisting hazardous materials and wastes during construction, operation, and maintenance.

Project construction and operation phases would involve hazardous material use. These materials would include, but would not be limited to, drilling additives and mud, diesel fuel, lubricants, solvents, oil, equipment/vehicle emissions, geothermal water, laboratory materials, and pentane (working fluid). The primary types of exposure to pentane are from inhalation, skin contact, and eye contact. The transport, use, or disposal of such hazardous materials could affect workers, the public, and the environment through accidental spills or emissions.

General geothermal lease stipulations for geothermal developers and site workers would be adhered to in order to address the potential impacts involving hazardous materials.

The geothermal power plant would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. A detailed reclamation plan, as part of the POU, would be developed in consultation with the US Navy, BLM, Reclamation, and other stakeholders before the power plant is built and operated.

Some quantities of hazardous and flammable materials will be contained in the systems and stored on site at the power plant site, behind locked gates. The pentane will be stored in quantities that require review under the Nevada Chemical Accident Prevention Program and the federal Risk Management Prevention program. These programs, typically completed after the final design of the project is complete and prior to the delivery of chemicals, require detailed analyses of the hazards and risks associated with the systems that contain the flammable substances and consideration of the off-site consequences of a worst-case and a reasonably foreseeable accidental release. Ormat will maintain its own fire protection system at the site and will prepare an Emergency Response Plan that will address procedures and notification requirements for releases of hazardous substances.

#### *Indirect Impacts*

Indirect impacts involving hazardous materials would entail transport and disposal of such materials to off-site locations, which could expose people and lands outside of the Project Area to hazardous materials.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POU.

*Residual Impacts*

No residual impacts have been identified for the Proposed Action.

**Alternative I (Preferred)***Direct Impacts*

Impacts from hazardous materials under Alternative I would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POU.

*Residual Impacts*

No residual impacts have been identified for Alternative I.

**No Action Alternative**

Under the No Action Alternative, there would be no impacts from hazardous materials.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts*

The proposed power plants, substations, switching stations, wells, pipelines, transmission lines, and access roads would be primarily on undeveloped land where no hazardous materials occur, so the project would not expose workers to any preexisting hazardous materials and wastes during construction, operation, and maintenance.

Project construction and operation phases would involve hazardous material use. These materials would include, but would not be limited to, drilling additives and mud, diesel fuel, lubricants, solvents, oil, equipment/vehicle emissions, geothermal water, laboratory materials, and ammonia water (working

fluid). The primary types of exposure to the hydrocarbon motive fluid (typically pentane, isopentane, or butane) are from inhalation, skin contact, and eye contact. The transport, use, or disposal of such hazardous materials could affect workers, the public, and the environment through accidental spills or emissions.

General geothermal lease stipulations for geothermal developers and site workers would be adhered to in order to address the potential impacts involving hazardous materials.

The geothermal power plant would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. A detailed reclamation plan, as part of the POU/POD, would be developed in consultation with BLM and other stakeholders before the power plant is built and operated.

Some quantities of hazardous and flammable materials will be contained in the systems and stored on site at all power plant sites, behind locked gates. The motive fluid for the binary plants will be stored in quantities that require review under the Nevada Chemical Accident Prevention Program and the federal Risk Management Prevention program. These programs, typically completed after the final design of the project is complete and prior to the delivery of chemicals, require detailed analyses of the hazards and risks associated with the systems that contain the flammable substances and consideration of the off-site consequences of a worst-case and a reasonably foreseeable accidental release. Vulcan will maintain its own fire protection system at the plant sites and will prepare a Hazardous Waste Operations Plan that will address procedures and notification requirements for releases of hazardous substances. Vulcan has also prepared a Hydrogen Sulfide Plan and a Blowout Contingency Plan.

#### *Indirect Impacts*

Indirect impacts involving hazardous materials would entail transport and disposal of such materials to off-site locations which could expose people and lands outside of the Project Area to hazardous materials.

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POU.

#### *Residual Impacts*

No residual impacts have been identified for the Proposed Action.

**Alternative I***Direct Impacts*

Impacts from hazardous materials under Alternative I would be the same as those described for the Proposed Action.

*Indirect Impacts*

Indirect impacts under Alternative I would be as described for the Proposed Action.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond the Environmental Protection Measures detailed in **Appendix E**. These Environmental Protection Measures along with a Spill Contingency Plan would be incorporated into the POD/POU.

*Residual Impacts*

No residual impacts have been identified for Alternative I.

**No Action Alternative**

Under the No Action Alternative, there would be no impact from hazardous materials.

**4.25 SOCIAL AND ECONOMIC VALUES****Summary****Assessment Methodology**

Impacts were analyzed in terms of the proposed increase in megawatts of geothermal energy and the associated changes expected in employment, income, tax revenue, public infrastructure needs, and other socioeconomic factors. Quantitative estimates were provided, when available, based on the best available data. Where quantitative data were not available, professional judgment was used to describe impacts using qualitative terms.

When secondary impacts are discussed, an economic multiplier effect of 2.5 is applied, based on standard multiplier effects observed in the geothermal industry (US DOE 2006b). This means that one dollar of investment in a geothermal venture produces \$2.50 in economic activity, or for every job created at a geothermal power plant an additional 2.5 jobs are created. Only some of the secondary impacts would occur in the local community.

**Indicators**

Potential impacts on socioeconomics and environmental justice were evaluated based on the following indicators:

- Effect on other land uses that currently create revenue;

- Effect on local industry that supports other land uses such as recreation and hunting;
- Effect on the nonmarket values of open space;
- Effect on expenditures or income within the Salt Wells Energy Projects Area and Churchill County;
- Induced growth or concentrations of populations;
- Displacement of a proportion of available residences in a community;
- Creation of a demand for additional housing that could not be sustained within the area;
- A decrease in local or Projects Area employment; or
- Displacement or disruption of businesses.

***Region of Influence***

The ROI for impacts on Social and Economic Values is defined as Churchill County.

**SPPC Project Area**

Direct and indirect impacts on socioeconomics include the potential for job creation and property values changes.

***Proposed Action******Direct and Indirect Impacts***

Population and Economic Activity. The Proposed Action may cause minor increases in population and economic activity within Churchill County during power line, sub-station, and switching station construction. The Proposed Action would require a relatively small addition to the Churchill County construction workforce. The Proposed Action would cause both direct and indirect job creation.

Power line, switching station, and substation construction is expected to directly increase construction employment by approximately 25 to 50 employees for the 12 to 15 month construction period. Project construction may require additional support personnel contracted by SPPC, including construction inspectors, surveyors, project managers, and environmental inspectors. This increase in workers represents an approximate increase of 3 percent of the 1,642 workers in the Churchill County construction workforce in 2008.

Some of the construction jobs or additional service jobs may be filled by workers already residing within Churchill County, while some workers may come from outside of Churchill County to fill new jobs or as contracted

employees from outside the region. Even if all the workers relocated to the Salt Wells Energy Projects Area from somewhere else, Churchill County has the infrastructure (e.g., temporary housing, schools, and public services) to absorb them without any socioeconomic impact. No substantial impacts on traffic in the area are anticipated as a result of workers travelling to and from project sites. Like most construction employment, the Proposed Action would be temporary and is not expected to result in a permanent increase in the population, employment, or spending within the region.

Based on the three percent temporary increase in construction employment, the Proposed Action is projected to result in a slight growth of the regional population and economic activity.

Property Values. Current land uses on private land in the area primarily include agriculture with a minimal amount of industrial and rural residential properties. The Proposed Action, particularly the proposed 230-kV transmission line, has the potential to reduce property value for these uses.

The development of the Proposed Action would necessitate the acquisition of easements over private property for the development of the transmission line. SPPC would provide financial compensation to private property owners when acquiring a property easement. Compensation for easements across private lands would be determined for each parcel as appropriate and would likely involve an appraisal process to identify the direct cost of purchasing an easement from a property owner and, where necessary, a calculation and compensation for consequential losses incurred on the remaining property as a result of power line construction. For the SPPC Proposed Action, a total of 35 parcels totaling 329 acres may require compensation along the proposed transmission line route. **Table 4-19, Number of Parcels and Total Acreage (not managed by BLM) Potentially Requiring Easement Acquisition by Zoning Category,** compares the properties that would be affected by easement acquisition for the Proposed Action and each of the Alternatives.

A review of current property value impact studies and the issue of high voltage power lines indicate that property values can be affected by the proximity to a power line and that the effects can depend on site-specific conditions. Property values can be impacted by views toward a power line and from the uncertainty of power line-related health hazards. Conversely, potential benefits can result from an adjacent power corridor creating a large open area near a property, potential recreational uses within or adjacent to the corridor, and increased separation between houses that are on either side of a corridor. Other factors, such as terrain, vegetation, size of power line towers or pylons, views from a particular property, and views toward power lines, conductors, or towers also greatly influence private property values (De Rosiers 2002). In general, other

**Table 4-19**  
**Number of Parcels and Total Acreage (not managed by BLM) Potentially**  
**Requiring Easement Acquisition by Zoning Category<sup>1</sup>**

|                                   |         | Agricultural(A5) 1<br>house per 5 acre<br>parcel | Agricultural(A10)-<br>1 house per 10<br>acre parcel | Industrial | Rural Residential<br>(RR20) 1 house<br>per 20 acres | Total Requiring<br>Easement<br>Acquisition |
|-----------------------------------|---------|--|---|------------|---|--|
| SPPC Proposed<br>Action           | Acres   | 49   | 149   | 0          | 131   | 329  |
|                                   | Parcels | 18   | 31  | 1          | 2   | 52   |
| Alternative 1                     | Acres   | 53   | 155   | 0          | 131   | 339  |
|                                   | Parcels | 22   | 63  | 0          | 2   | 87   |
| Alternative 2                     | Acres   | 49   | 148   | 0          | 131   | 328  |
|                                   | Parcels | 18   | 32  | 1          | 2   | 53   |
| Alternative 3                     | Acres   | 49   | 152   | 0          | 131   | 332  |
|                                   | Parcels | 18   | 29  | 1          | 2   | 50   |
| Macari Fiber<br>Optic Alternative | Acres   | 0  | 0   | 0          | NA  | 0  |
|                                   | Parcels | 0  | 0   | 0          | 1   | 1  |

<sup>1</sup>Acres and Parcels determined for permanent 125-foot ROW corridor for Proposed Action and Alternatives 1 and 2. For the Macari Fiber Optic Alternative, easement of 6 feet required as described in Chapter 2.

Source: Churchill County 2010.

factors such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of real estate. When property value impacts are evident, studies report an average discount of between one percent and 10 percent of property values. This diminution in value is attributable to the visual unattractiveness of the lines, perceived health hazards, noise, and safety concerns. These impacts diminish as distance from the lines increases and disappear at a distance of 200 feet from the lines (Pitts and Jackson 2007). Both the market interviews and academic literature show that the impacts of power lines on residential properties are varied and difficult to measure. The impacts from power lines, as well as other negative externalities, depend on many factors, including market condition, location and personal preference (Pitts and Jackson 2007).

Based on a review of studies undertaken since the 1980s investigating the effect of transmission lines on property values, Chalmers and Voorvart (2009), found that 16 of these studies form the core of the professional literature and are widely quoted and cross-referenced one to the other and that the results of these studies could be generally summarized as follows:

- Over time, there is a consistent pattern with about half of the studies finding negative property value effects and half finding none.
- When effects have been found, they tend to be small. Almost always less than 10 percent and usually in the range of three to six percent.
- Where effects are found, they decay rapidly as distance to the lines increases and usually disappear at about 200 feet to 300 feet (61 to 91 meters).
- Two studies investigating the behavior of the effect over time found that, where there were effects, they tended to dissipate over time.
- There does not appear to have been any change in the reaction of markets to high-voltage transmission line proximity after the results of two widely publicized Swedish health-effect studies were preliminarily released in 1992.

In summary, they found that the relatively small effects on property values attributed to transmission line proximity in the literature does not mean that the direction of the effect of transmission lines on property values is not negative. The professional literature cited, combined with the results reported in their article, support the position that a presumption of material negative effects of transmission lines on property values is not warranted. It is fair to presume that the direction of the effect would in most circumstances be negative, but the existence of a measurable effect and the magnitude of such an effect can only be determined by empirical analysis of actual market transactions (Chalmers and Voorvart 2009).

In addition, studies of impacts to residential property values during periods of physical change, such as a new transmission line construction or structural rebuilds, have revealed greater short term impacts. However, most studies have concluded that other factors such as location of the property, type and condition of improvements, and the level of real estate activity are far more important than the presence of transmission lines in determining the value of residential property (Bottemiller et. al. 2000).

The majority of the proposed transmission line route would be in rural agricultural or industrial areas. For such areas, the Proposed Action is expected to result in a slight decrease in property values consistent with the studies outlined previously. The POD would include measures to minimize any direct impacts on area residents during project construction. All areas temporarily disturbed during construction activities would be reclaimed following project development. As discussed in Section 4.2 the transmission structure proposed from the Macari Switching Station to the Greenwave Substation would be single pole structures spaced at 400 foot intervals with concrete foundations of 6 to 8 feet in diameter. The lines would be 80 to 85 feet above ground. Following construction of the transmission line, agricultural operations and other uses of the lands could continue around the transmission line poles and under the lines.

Additional impacts on property values may occur as a result of the construction of the Greenwave Substation, and the proposed 60-kV electric line folds. The Greenwave Substation would be located on private land. All private property for these project components would be purchased by SPPC, and no additional easement acquisitions would be required. As described for the transmission line, the majority of the proposed locations are in rural areas or adjacent to existing energy structures and impacts on adjacent property value are expected to be minimal. The possible exception is the Greenwave Substation, which is located within 500 feet of several residences, one school, and one church. Mitigation measures proposed for visual impacts would ensure that the switching stations and other facilities blend into the environment as much as possible.

Other direct and indirect impacts. Additional direct impacts include contributions to the local government tax base from the construction of the project. Indirect tax contributions, as a result of increased economic activity in the local area are also possible.

Construction and operation of the Proposed Action could affect nearby recreational resources, which also could affect the economies of the areas in which the recreational resources are located if fewer visitors use the resources (and spend fewer dollars in the local economy). Revenues associated with recreation could decline if these activities were reduced or eliminated, or increase if they were made more accessible. Recreation in the area is dispersed and includes hunting, wildlife viewing, and OHV use. The Pony Express National Historic Trail may be impacted by portions of the project, in particular the viewshed from the trail. Portions of the SPPC Project Area would be unavailable for recreation during construction of the transmission line and switching stations, and the switching station sites would be permanently unsuitable for recreation. Addition of access roads for the project may increase access to recreational activities in the area particularly for OHV use, which may have temporary impacts on local recreational use until such roads are reclaimed. While some areas used for recreation would be impacted, recreation in the region is dispersed and there are plenty of other open and public lands available for such uses. No impact on money spent on recreation is expected.

Ranchers rely on portions of the geothermal leasing areas for grazing. The level of local economic impact of proposed activities on grazing would depend on the extent to which reducing the grazing areas would reduce the size or health of a permit holder's herds or require that a permit holder lease or purchase additional lands. It is not anticipated that the level of impacts would affect the economic livelihood of ranchers and herders. Details are provided in **Section 4.18, Livestock Grazing.**

#### *Mitigation and Monitoring Measures*

No mitigation or monitoring measures are proposed beyond compensations being paid for easements.

*Residual Impacts*

No residual impacts are anticipated for this project.

***Alternative 1***

Impacts under Alternative 1 would be similar to those described under the Proposed Action. The Alternative transmission line configuration would result in an additional 35 parcels potentially requiring easement acquisition, the majority of which are zoned for agricultural uses. Mitigation would be the same as described under the Proposed Action and no residual impacts would remain.

***Alternative 2***

Impacts under Alternative 2 would be similar to those described under the Proposed Action. The Alternative transmission line configuration would result in one additional parcel, zoned for agricultural uses, potentially requiring easement acquisition. Mitigation would be the same as described under the Proposed Action and no residual impacts would remain.

***Alternative 3 (Preferred)***

Impacts under Alternative 3 would be similar to those described under the Proposed Action. The Alternative 3 transmission line configuration would result in two fewer parcels zoned for agricultural uses, potentially requiring easement acquisition. Mitigation would be the same as described under the Proposed Action and no residual impacts would remain.

***Macari Fiber Optic Alternative***

Under this Alternative, the transmission line route would be the same as for the Proposed Action or chosen Alternative. The Alternative then includes a fiber optic cable going east-west along Macari Lane that would be routed in an underground trench. The additional fiber-optic cable and trenching proposed for this Alternative may necessitate additional construction employees. In addition, there is one additional parcel that may require easement acquisition.

***No Action Alternative***

Under the No Action Alternative, the proposed transmission line and associated facilities as proposed in this EIS would not be built. No changes to the existing employment levels would occur; no new income would be generated beyond existing trends; and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the Proposed Action.

**Ormat Project Area**

The ROI for the Ormat Project Area is Churchill County.

### **Proposed Action**

#### *Direct Impacts and Indirect Impacts*

Population and Economic Activity. The Proposed Action may cause minor increases in population and economic activity within Churchill County during construction of the Carson Lake Binary Power Plant and Substation, Macari Switching Station, and a 230-kV transmission line between Carson Lake Substation and the Macari Switching Station as well as well pads and access roads. The Proposed Action would require a relatively small addition to the Churchill County construction workforce. Because the effect on the workforce would be minimal, the overall project-induced direct and indirect effects on the Churchill County economy are also expected to be minimal and beneficial.

Power plant construction is expected to directly increase construction employment by approximately 25 to 50 employees but would average about 25 on site for the duration of the 8- to 12-month construction period. In addition, pipeline construction would require approximately 35 workers over a period of approximately 9 months. Pipelines would be constructed after the wells are drilled and before the power plant begins operation.

This maximum number of workers at a given time, 85, represents an approximate temporary increase of 5.1 percent of the 1,642 workers in the 2008 Churchill County construction workforce. The actual number of workers is likely to be less at any given time. The number of permanent employees that may be required has not been determined, but would be significantly smaller than the construction workforce.

Some of the construction jobs or additional service jobs may be filled by workers already residing within Churchill County, while some workers may come from outside of Churchill County to fill new jobs or as contracted employees from outside the region. Even if the maximum workers relocated to the Ormat Project Area from somewhere else, Churchill County has the infrastructure (e.g., housing, schools, and public services) to absorb them without any socioeconomic impact. No substantial impacts on traffic in the area are anticipated as a result of workers. Like most construction employment, the Proposed Action would be temporary and is not expected to result in a permanent increase in the population, employment, or spending within the region.

Based on the 5.1 percent temporary increase in construction employment, the Proposed Action is projected to result in a relatively slight growth of the overall population and economic activity in the region. The minor increases and the currently adapted economy of the area to such projects indicate that all social and economic effects are expected to be minimal and beneficial; accordingly, no mitigation is required.

Property Values. All private land in the Ormat Project Area has been purchased by the proponent. The proposed power plant and substation and switching station would all occur on private land owned by Ormat. Proposed pipelines and wells would be located on public land. Therefore there would be not impacts on land value associated with the Proposed Action. Elevated noise levels at the property line could result in a decrease in the value of adjacent property if that property were ever to be used for a noise-sensitive land use, such as housing.

Other direct and indirect impacts. Additional direct impacts include contributions to the local government tax base from the construction of the project and operation of the Carson Lake Binary Power Plant. Indirect tax contributions as a result of increased economic activity in the local area are also possible.

Construction and operation of the Proposed Action could affect nearby recreational resources, which also could affect the economies of the areas in which the recreational resources are located if fewer visitors use the resources and spend fewer dollars in the local economy. Revenues associated with recreation could decline if these activities were reduced or eliminated. Portions of the Ormat Project Area would be unavailable for recreation during construction and the power plant and associated structures on public lands would be permanently unsuitable for recreation. Addition of access roads for the project may temporarily increase access to recreational activities in the area, particularly for OHV vehicle use, which may have minor impacts on local recreational use. Recreational opportunities similar to those in the Project Area are abundant across the ROI.

Ranchers rely on portions of the Project Area for grazing. The level of local economic impact of proposed activities on grazing would depend on the extent to which reducing the grazing areas would reduce the size or health of a permit holder's herds or require that a permit holder lease or purchase additional lands. It is not anticipated that the level of impacts would affect the economic livelihood of ranchers and herders. Details are provided in **Section 4.18, Livestock Grazing.**

#### *Mitigation and Monitoring Measures*

Due to the lack of permanent impacts on socioeconomic resources from the Proposed Action, no mitigation or monitoring measures are recommended.

#### *Residual Impacts*

No residual negative impacts would result from the Proposed Action.

#### **Alternative I (Preferred)**

Impacts, mitigation and monitoring measures, and residual impacts under Alternative I are the same as those described under the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, the proposed power plant and associated facilities would not be built. No changes to the existing employment levels would occur; no new income would be generated beyond existing trends; and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the No Action Alternative.

**Vulcan Project Area****Proposed Action (Preferred)***Direct Impacts and Indirect Impacts*

Population and Economic Activity. The Proposed Action involves the construction of as many as four power plants and associated substations, a 230-kV transmission line and switching station, and as many as 26 well pads and associated wells, roads, and pipelines. The Proposed Action may cause minor increases in population and economic activity within Churchill County during construction and operation of the power plants, sub-station construction, and during well drilling and pipeline construction. The Proposed Action would require an addition to the Churchill County construction workforce and a small number of permanent employees.

*Binary Power Plants:* Vulcan proposed to construct as many as three nominal 30-MW (net) binary geothermal power plants at Power Plant Sites 1, 2, and 4 and either 30-MW (net) binary or 60-MW (net) flash power plants at Power Plant Sites 3 and 5 for a maximum output of 120 MW (net). Workforce estimates for the binary power plants include as many as 122 workers during the construction of each 30-MW (net) power plant and associated well field and interconnection facilities. Up to two binary power plants may be constructed at a given time. If two 30-MW (net) power plants are constructed, as many as 244 power plant construction workers would be needed.

In addition, Vulcan may use two or three drilling crews at a time to complete drilling of the proposed production and injection wells needed for the 120 MW of total proposed development. Each drilling crew would have approximately six workers, and drilling is expected to continue to the completion of power plant construction. Well pads typically require a crew of six workers for their construction.

Total construction employment for maximum binary power plant and well field construction scenarios would therefore employ approximately 262 temporary employees. Once two 30-MW power plants are installed, the plants and well field operations would have a combined estimated 33 employees. The staffing plan assumes six power plant operators for the first 30-MW binary power plant

and four for the second 30-MW binary power plant. Additional power plants would require a similar number of operators.

*Flash Power Plant:* Vulcan estimates that it would need approximately 130 workers during the construction of a 60-MW (net) flash power plant and associated well field and interconnection facilities. The 60-MW flash power plant construction is expected to require 12 to 15 months. Construction of the 60-MW (net) flash well field pipelines requires the same estimated work force as identified under the binary power plant development.

In addition, Vulcan may use two or three drilling crews to complete drilling of the 24 production and injection wells needed for the first 60-MW phase of development. As described for the binary power plant, each drilling crew would have approximately six workers, and drilling is expected to continue to the completion of power plant construction. If additional well pads are needed, a crew of six workers would be needed to construct each proposed well pad.

Once the 60-MW flash power plant was installed, the plant and well field operations would have an estimated total of 26 employees. The permanent staffing plan assumes five operators for the power plant. Complete 24-hour coverage, 7 days per week requires 168 hours, divided into 40-hour work weeks per person, resulting in 4.2 work weeks per week. Thus, five power plant shift operators could handle power plant operations, factoring in sick time and vacation. Additional power plants would require a similar number of operators.

In summary, the maximum number of workers needed for construction of power plants and associated structures at a given time is 270. A breakdown of the estimated workers required for different build-out scenarios is shown in **Table 4-20, Temporary Construction Staffing - Direct Employment**. The maximum proposed build-out represents an approximate temporary increase of 16 percent of the 1,642 workers in the 2008 Churchill County construction workforce. It is unlikely that all work would occur simultaneously; therefore the actual number of workers required at any given time is likely to be much smaller. Some of the construction jobs may be filled by workers already residing within Churchill County, while some workers may come from outside of Churchill County to fill new jobs or as contracted employees from outside the region, particularly for temporary construction positions. While the construction employment represents a substantial increase in employment in this sector in the County, this increase would be temporary. Churchill County has supported development of large geothermal plants previously; including the 66-MW Dixie Valley project. Housing vacancy rates as of 2009 for housing are at over 19 percent in Churchill County. In addition, unemployment rates in the county (9.1 percent annual rate in 2009) and the State of Nevada (11.8 percent annual rate in 2009) indicate that the work force would be available to support this project (Bureau of Labor Statistics 2010). Even if the maximum workers relocated to the Vulcan Project Area from somewhere else, Churchill County

has the infrastructure (e.g., housing, public services) to absorb them without any substantial permanent socioeconomic impact.

**Table 4-20**  
**Temporary Construction Staffing - Direct Employment**

| <b>Proposed Build Out</b>   | <b>Maximum number of construction workers required at one time<sup>1</sup></b> |
|---|--|
| One 30-MW Binary Power Plant and Associated Well Field and Interconnection Facilities | 122  |
| Associated Production and Injection Wells   | 18   |
| <b>TOTAL</b>  | <b>140</b>   |
| One 60-MW Flash Power Plant and Associated Well Field Interconnection Facilities      | 130  |
| Associated Production and Injection Wells   | 18   |
| <b>TOTAL</b>  | <b>148</b>   |
| Two 30-MW Binary Power Plants   | 244  |
| Associated Production and Injection Wells   | 18   |
| <b>TOTAL</b>  | <b>262</b>   |
| One 30-MW Binary Power Plant and One 60-MW Flash Power Plant                          | 252  |
| Associated Production and Injection Wells   | 18   |
| <b>TOTAL</b>  | <b>270</b>   |

<sup>1</sup>Assumes simultaneous construction of a maximum number of 2 power plants at a given time.

Long term staffing of the completed power plants could result in an increase of approximately 69 permanent employees. A breakdown of the estimated permanent employees under different build-out scenarios is shown in **Table 4-21**, Permanent Staffing - Direct Employment. Using a multiplier of 2.5, there is the potential for an additional 173 jobs in the local economy, particularly in the service sector. While the addition of jobs would bring some increase in money to the local area, the permanent jobs created are not expected to result in a substantial permanent increase in the population, employment, or spending within the region; a maximum direct and indirect increase would represent a one percent change over the total current workforce in the County. It is likely that the indirect employment would not all be included in the local area.

**Table 4-21**  
**Permanent Staffing - Direct Employment**

| <b>Proposed Build Out</b>   | <b>Permanent Employees</b> |
|---|----------------------------|
| One 30-MW Binary Power Plant                                      | 6                          |
| Associated Well Field   | 23                         |
| <b>TOTAL</b>  | <b>29</b>                  |
| Two 30-MW Binary Power Plants                                     | 10                         |
| Associated Well Field   | 23                         |
| <b>TOTAL</b>  | <b>33</b>                  |
| One 60-MW Flash Power Plant                                       | 5                          |
| Associated Well Field   | 21                         |
| <b>TOTAL</b>  | <b>26</b>                  |
| Two 30-MW Binary Power Plants and<br>Two 60-MW Flash Power Plants | 20                         |
| Associated Well Fields  | 49                         |
| <b>TOTAL</b>  | <b>69</b>                  |

Property Values. All private land in the Vulcan Project Area has been purchased by the proponent. There is very limited development in the surrounding area and no residences. Therefore, there would be no impacts on land value from the Proposed Action.

Other direct and indirect impacts. Additional direct impacts include contributions to the local government tax base from the construction of the project and operation of the power plants. Indirect tax contributions, as a result of increased economic activity in the local area are also possible.

Construction and operation would not impact public utilities. Water for construction would be obtained from wells on site, or bought from irrigation districts or private parties. Vulcan would not require any surface water for the geothermal power plants during normal operations.

Construction and operation of the Proposed Action could affect nearby recreational resources, which could affect local economies if fewer visitors use the resources (and spend fewer dollars in the local economy). Revenues associated with recreation could decline if these activities were reduced or eliminated or increase if they were made more accessible. The viewshed from the Pony Express National Historic Trail may be impacted by portions of the project. Portions of the Vulcan Project Area would be unavailable for recreation during construction of the power plants, and associated structures on public lands and some sites would be permanently unsuitable for recreation. Addition of access roads for the project may temporarily increase access to recreational activities in the area, particularly for OHV vehicle use, which may have minor impacts on local recreational use. While some areas used for recreation would be impacted, recreation in the region is dispersed and there are plenty of other

open and public lands available for such uses. No impact on money spent on recreation is expected.

Ranchers rely on portions of the Project Area for grazing. The level of local economic impact of proposed activities on grazing would depend on the extent to which reducing the grazing areas would reduce the size or health of a permit holder's herds or require that a permit holder lease or purchase additional lands. It is not anticipated that the level of impacts would affect the economic livelihood of ranchers and herders. Details are provided in **Section 4.18, Livestock Grazing**.

*Mitigation and Monitoring Measures*

No mitigation or monitoring measures are recommended.

*Residual Impacts*

No residual negative impacts would result from the Proposed Action.

**Alternative I**

Impacts under Alternative I would be the same as those described under the Proposed Action.

**No Action Alternative**

Under the No Action Alternative, the proposed power plants and associated facilities would not be built. No changes to the existing employment levels would occur, no new income would be generated beyond existing trends, and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the Proposed Action.

## 4.26 ENVIRONMENTAL JUSTICE

### Summary

**Assessment Methodology**

On February 11, 1994, President William Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This Executive Order was designed to focus the attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities. In an accompanying Presidential memorandum, the President emphasized that existing laws, including NEPA, provide opportunities for federal agencies to address environmental hazards in minority and low-income communities. In April of 1995, the EPA released the document titled Environmental Justice Strategy: Executive Order 12898. The document established EPA-wide goals and defined the approaches by which the EPA would ensure that disproportionately high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed. The socioeconomic characteristics of the ROI were analyzed for the

presences of minority and/or low-income populations according to the EPA's Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (EPA 1998).

#### **Indicators**

EPA's Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (EPA 1998) suggests a screening process to identify environmental justice concerns. This two-step process defines the impact indicators for this issue; if either criteria is unmet, there is little likelihood of environmental justice effects occurring. The two-step process is as follows:

- (1) Does the potentially affected community include minority and/or low-income populations?
- (2) Are the environmental impacts likely to fall disproportionately on minority and/or low income members of the community and/or tribal resource?

If the two-step process discussed under Study Methods indicates that there exists a potential for environment justice effects on occur, the following analyses are conducted to consider the following:

- whether there exists a potential for disproportionate risk of high and adverse human health or environmental effects; whether communities have been sufficiently involved in the decision-making process; and
- whether communities currently suffer, or have historically suffered, from environmental and health risks and hazards

#### **Region of Influence**

The ROI for analysis of Environmental Justice impacts is the Salt Wells Energy Projects Area.

### **SPPC Project Area**

#### **Proposed Action and Alternatives**

In the context of analyzing the Proposed Action for potential effects on minorities, any area containing a minority population greater than 50 percent of the total population or containing a minority population meaningfully greater than the minority population in Churchill County would be identified as a minority population within the Salt Wells Energy Projects Area.

Low income populations are defined as persons living below the poverty level based on total income of \$10,991 for an individual and \$22,025 for a family household of four for 2008 data (US Census Bureau 2009). There are no known minority populations fitting the definition for environmental justice concerns within the SPPC Project Area. The Fallon Paiute-Shoshone Tribe of the Fallon

Reservation and Colony consists of 60 acres two miles northeast of Fallon and 8,000 acres 12 miles to the northeast of Fallon. Any potential physical effects of constructing and operating the proposed facilities would be unlikely to affect these populations.

In addition, there is not a meaningfully greater low-income population in the Project Area than for the County as a whole. Poverty rates for the census tracts composing the majority of the Project Area were found to have a lower percentage of persons living below the poverty level than the County or state level (US Census Bureau 2010); therefore, there are no direct or indirect impacts anticipated as a result of the Proposed Action or Alternatives.

### **Ormat Project Area**

#### ***Proposed Action and Alternatives***

As described for the SPPC project, there are no known minority or low income populations fitting the definition for environmental justice concerns within the Project Area; therefore, there are no direct or indirect impacts anticipated as a result of the Proposed Action or Alternatives.

### **Vulcan Project Area**

#### ***Proposed Action and Alternatives***

As described for the SPPC project, there are no known minority or low income populations fitting the definition for environmental justice concerns within the Project Area; therefore, there are no direct or indirect impacts anticipated as a result of the Proposed Action or Alternatives.

## **4.27 THE RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

This section compares the potential temporary effects of the alternatives analyzed in this EIS on the environment with the potential effects on its long-term productivity. The BLM must consider the degree to which the Proposed Actions or Alternatives would sacrifice a resource value that might benefit the environment in the long-term, for some temporary value to the proponent or the public.

Implementation of the Proposed Actions or Alternatives would require use of the environment for construction, operation and maintenance of the power plants, substations, switching stations, access roads, pipelines, well pads, and the transmission line corridors. Most land disturbance would be temporary and would be concurrent with site preparation and construction of the facilities. These effects include soil disturbance, increased erosion potential, water use, vehicle and equipment emissions, fugitive dust, and habitat disturbance. Measures would be employed to minimize disturbances and reclaim or improve vegetation cover, soil, and wildlife habitat on these lands within five years. To the extent that disturbances can be reclaimed, other productive use of these

lands would not be precluded in the long term. Regional economies could be expected to experience temporary benefits from related expenditures and employment opportunities during construction.

Overall productivity would remain similar to existing conditions where land uses are not substantially changed. Where undeveloped land is used for facilities or is designated as a utility corridor, most other productive uses would be precluded. Some agricultural and grazing uses could continue and other utilities could use the corridor, potentially reducing the use of other land for this purpose. There is potential for mitigated permanent loss of cultural resources. There would be some loss of existing vegetation, soil, and quality of habitat available for wildlife, but most of the study area has vegetation cover and habitat that is common to the region. The placement of transmission lines could cause visual impacts. These resources would be committed along the length of the corridor and at the substations for the life of these facilities or their successors. If no longer needed, these lands would be restored to a suitable condition consistent with zoning or adjacent land use. Full recovery of these lands and restoration of any lost habitat or associated wildlife is not assured.

The Proposed Actions and Alternatives would help meet electrical power distribution infrastructure needs in the region, maintain and enhance productivity, and provide permanent economic benefits. Overall, the Proposed Actions' use of the environment has very little adverse impact on the maintenance and enhancement of long-term productivity. Implementation of the No Action Alternative would require fewer resource commitments but would be associated with future infrastructure deficiencies and the reduced ability to provide electrical power for residential, commercial and industrial uses regionally.

#### **4.28 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource). The Proposed Actions and Alternatives would not result in a large commitment of nonrenewable resources.

Land would be disturbed during construction and during the life of the facilities and their successors. There would be some loss of existing vegetation, habitats, and wildlife resources. Land not needed for operation and maintenance of the facilities would be reclaimed immediately after construction. At the end of the useful life of the facilities these lands could be reclaimed as well. While every

effort would be made to recover native vegetation and habitat, full restoration of preexisting conditions is not assured.

Project construction would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by construction equipment and by workers commuting to the site. Construction materials and some equipment that may not be productively recycled would be consumed by the project. Ongoing operation and maintenance of the facilities would use marginal amounts of fuels, lubricants and other nonrenewable consumables.

The Proposed Actions and Alternatives would provide more electrical capacity and reliability to the region. To the extent that the improvements would accommodate projected population growth and demand, the project would contribute indirectly to future potential resource loss associated with the development of housing, businesses, industry and infrastructure. These would include the potential loss of native vegetation and habitat, conversion of agricultural lands, changes in air quality, noise levels, and cultural resources.

Cultural resources are by their nature irreplaceable, so altering or eliminating any such resource, be it National Register eligible or not, represents an irreversible and an irretrievable commitment. Mitigations, however appropriate, often preclude preservation or other future desirable management options. There would also be a potential for irretrievable loss of the regional resource base for future scientific use and interpretation and for irretrievable loss of resources of value to contemporary Native American groups.

This page intentionally left blank.